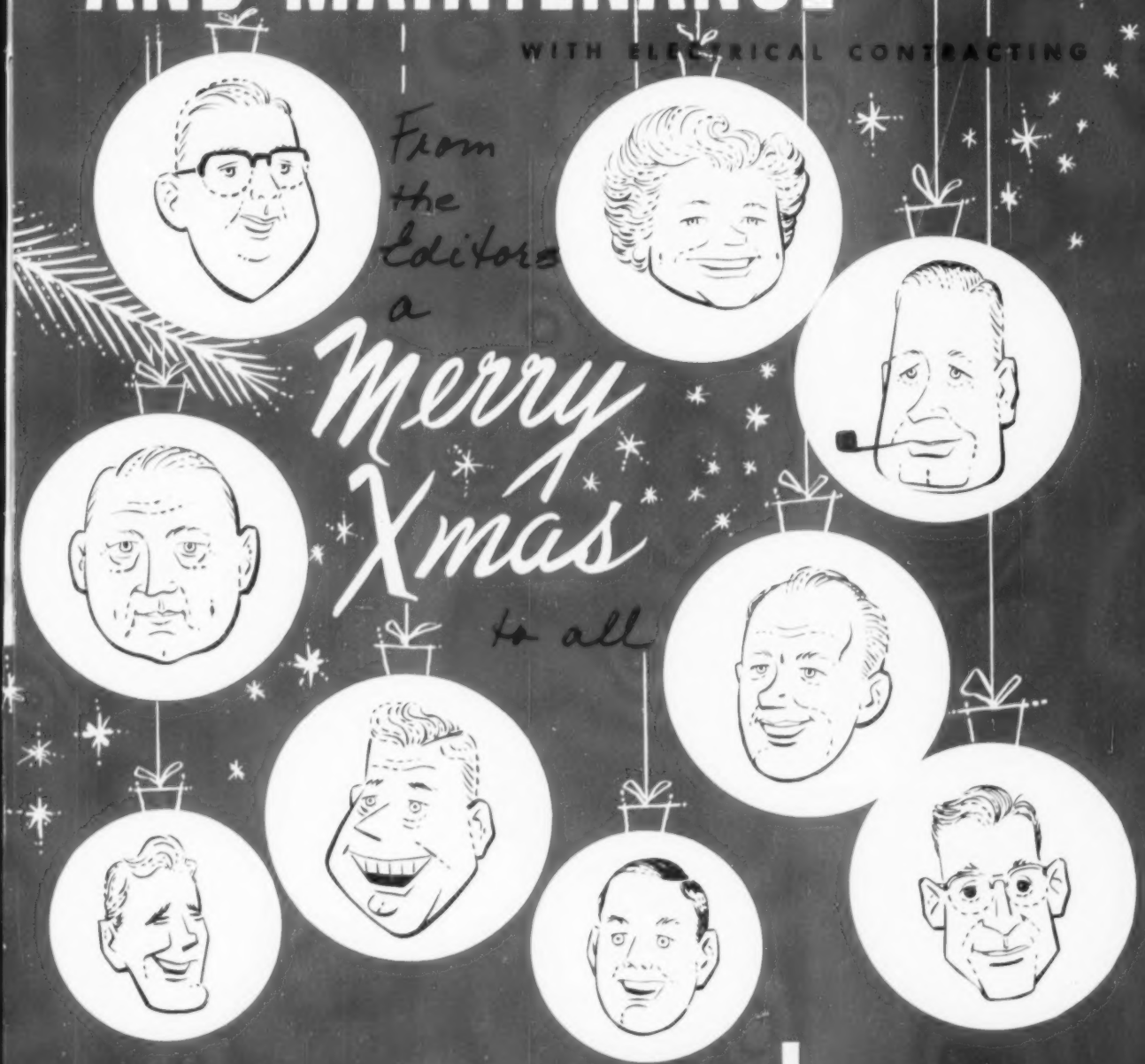
DECEMBER • 1957
PRICE 40 CENTS

ELECTRICAL CONSTRUCTION AND MAINTENANCE

WITH ELECTRICAL CONTRACTING



A McGRAW-HILL PUBLICATION

57TH YEAR

he's using
the Best
Electrical
Tape...

ACCURATE TAPE

Friction • Rubber • Plastic

Send **today** for our most recent bulletin describing details.

ACCURATE MANUFACTURING CO.
GARFIELD, NEW JERSEY

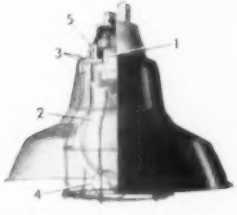
Cuts Re-lamping Costs

IN HALF!

Adapts For Larger Lamp Size

WITHOUT RE-WIRING!

New CROUSE-HINDS
VAPORMASTER® Lighting Fixtures



1 *Shock-absorbing receptacle* – takes jolts from any direction. 2 *Pear-shaped globe* – plenty of clearence for lamp. 3 *Vapor-tight seals throughout* – fully gasketed construction. 4 *Globe clamping spring* – flips open for re-lamping – no tools needed. 5 *Aluminum adapter-guard* – 2 sizes fit *all* Condulet bodies.

Here is vapor-tight, shockproof industrial lighting engineered for the greatest possible economy and convenience in both installation and maintenance.

In any indoor or outdoor exposure to moisture, rain, gases, dirt, or corrosive vapors . . . a new standard of operational efficiency is set by the new VaporMaster series. Cleaning and re-lamping is done in half the time, *without tools*. Whenever a demand for a change in lighting intensity develops, a simple change of adapters accommodates the larger lamp – without touching the wiring!

Hundreds of fixture combinations may be assembled from 33 standard components to meet your varying needs. Typical choices:

- *Condulet® bodies* in pendent, ceiling or bracket types and with side hubs.
- Adapters in two forms . . . one for lamps up to 150-watts A23 . . . one for 200- and 300-watts PS30 medium base lamps. Sizes may be changed without disturbing wiring merely by installing adapter for the desired lamp.

ASK FOR CATALOG INFORMATION ON THE VAPORMASTER SERIES TODAY

Just call your Crouse-Hinds distributor . . . or nearest Crouse-Hinds office.

A NATIONWIDE DISTRIBUTION exclusively through ELECTRICAL DISTRIBUTORS

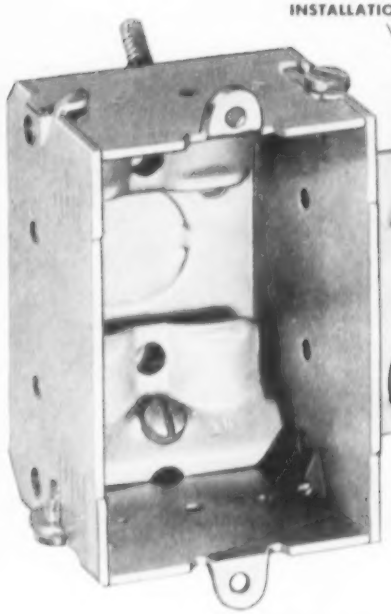
CROUSE-HINDS COMPANY

Main Office and Factory: Syracuse, N. Y.
Crouse-Hinds Company of Canada, Ltd.: Toronto, Ont.

OFFICES: Baton Rouge, Birmingham, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Corpus Christi, Dallas, Denver, Detroit, Houston, Indianapolis, Kansas City, Los Angeles, Milwaukee, New Orleans, New York, Philadelphia, Pittsburgh, Portland, Ore., St. Louis, St. Paul, San Francisco, Seattle, Tulsa, Washington. RESIDENT REPRESENTATIVES: Albany, Atlanta, Baltimore, Charlotte, Chattanooga, Jacksonville, Reading, Pa., Richmond, Va., Shreveport

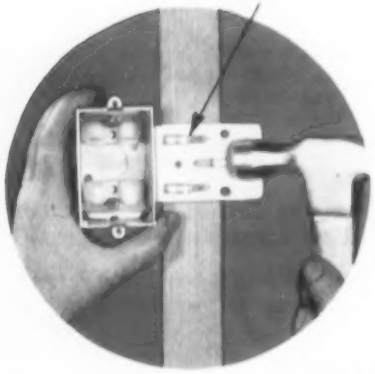
FLOODLIGHTS • CONDULETS • TRAFFIC SIGNALS • AIRPORT LIGHTING

APPLETON announces another First!



new "Eagle Claw" Box

NO NAILS REQUIRED!



There are holes at end of bracket for the rare occasion when switch box must be set on studding at full length of bracket.

Here is the industry's first Underwriters' approved Switch Box which requires *no nails* to mount! The notched prongs are simply hammered into the wood and the "EAGLE CLAW" bracket locks the box to the studding. As prongs enter the wood, they curve away from each other . . . can't possibly work loose! Due to special compensating angle of bracket, box always rests at true 90° angle after prongs are hammered in. Feature for feature, nothing touches these new, money saving **APPLETON "EAGLE CLAW" Switch Boxes.** Specify them on your next order!

Sold Through Franchised Wholesalers Only

APPLETON ELECTRIC COMPANY • 1701 Wellington Avenue • Chicago 13, Illinois

APPLETON ELECTRIC - PRODUCTS

Rely on APPLETON... The Standard for Better Wiring

ELECTRICAL CONSTRUCTION AND MAINTENANCE

with which is consolidated Electrical Contracting, The Electragist and Electrical Record — Established 1901

Published for electrical contractors, industrial electricians, engineers, consultants, inspectors and motor shops. Covering engineering, installation, repair, maintenance and management, in the field of electrical construction and maintenance.

57th Year DECEMBER • 1957

Sidelights 5

Washington Report 7

Good Prospects for '58, *An Editorial* 67

Power in a Medical Building 69

By J. F. McPARTLAND—A study of modern design details and construction methods in the electrical system for an 18-story medical office building in Houston, Texas.

Winners in Lighting Competition 74

By B. C. COOPER—Nine lighting authorities review 244 entries in the 1957 International Lighting Competition.

Contractors in Cincinnati 80

Convention personalities at the annual meetings and electrical trade exposition of NECA held in Cincinnati.

New Lease on Life 84

Quarter-century-old Los Angeles building is modernized.

Low-Voltage Switching—What It Is, How It Works 88

A roundup of ratings, characteristics and applications of remote-control systems and components.

Estimating Forum—VI 94

By RAY ASHLEY—Operating costs—Use of research data as guide to overhead study.

MORE

DECEMBER • 1957 *continued*

Fire Alarm Sales 96

Long Island Contractor's fire alarm sales are direct result of energetic promotion and successful merchandising ideas.

Luminous Ceilings on 277 Volts 98

Spread-out high school facility in El Sobrante, Calif., has primary service, 277/480-volt distribution and 47,000 sq ft of luminous ceilings in classrooms and library.

Practical Methods 105

Electronic analog computer specifies motors and controls for steel mill; elevator scaffold boosts job efficiency; portable threader speeds conduit work.

Reader Service 117

Product news announcements; catalogs and bulletins.

Reader's Quiz 155

Questions and answers on impedance on transformer bank; motor starters; induction motor.

Questions on the Code 165

Answers to code questions on wiring recessed fixtures; low voltage control; service disconnects multiple occupancy.

In the News 183

Dates Ahead 198

W. T. STUART, *Editor*

Alice McMullen, *Associate Editor*

Berlon C. Cooper, *Eastern Editor*

August Eckel, *Middle West Editor*

Hugh P. Scott, *Industrial Editor*

J. F. McPartland, Jr., *Engineering Editor*

W. J. Novak, *Assistant Editor*

W. J. Martens, *Assistant Editor*

L. E. Devendorf, *Art Editor*

Ray Ashley, B. A. McDonald, Glenn Rowell, B. Z. Segall, *Consulting Editors*

W. A. Cyr, *Western Consultant*

Dexter Keezer, *Dir. Economic Staff*

George B. Bryant, Jr., *Chief Correspondent, Washington Bureau*

John Wilhelm, *Editor, World News*

W. W. GAREY, *Publisher*

A. L. DeWeerdt, *Circulation Manager*

C. B. Shaw, *Advertising Sales Manager*

District Managers

A. B. Conklin, *New York*

S. A. Jones, *New York*

E. P. Gardner, *Philadelphia*

F. J. Seiler, *Cleveland*

R. A. Hubley, *Detroit*

Charles F. Minor, Jr., *Chicago*

R. R. Ream, *Chicago*

T. H. Carmody, R. C. Alcorn, *San Francisco*

George Miller, *Dallas*

R. H. Antles, *Los Angeles*

R. H. Powell, *Atlanta*

Member of
AUDIT BUREAU OF CIRCULATIONS and ASSOCIATED BUSINESS PUBLICATIONS

Vol. 56, No. 12 ELECTRICAL CONSTRUCTION and MAINTENANCE December 1957

Published monthly with an additional issue in September by McGraw-Hill Publishing Company, Inc. James H. McGraw (1860-1948), Founder. Executive, Editorial and Advertising Offices: McGraw-Hill Building, 330 W. 42nd St., New York 36, N. Y. Publication Office, 99-129 North Broadway, Albany 1, N. Y. Donald C. McGraw, President; Joseph A. Gerardi, Executive Vice President; L. Keith Goodrich, Vice-President and Treasurer; John J. Cooke, Secretary; Nelson Bond, Executive Vice-President, Publications Division; Ralph B. Smith, Vice-President and Editorial Director; Joseph H. Allen, Vice-President and Director of Advertising Sales; A. R. Venezian, Vice-President and Circulation Coordinator.

Subscriptions are solicited only from persons engaged in electrical construction, maintenance or consulting services. Position and company connection must be indicated on subscription orders.

United States subscription rate for individuals in the field of the publication $3.00 per year. This issue 40 cents. Electrical Products Guide $2.50. Canada, $5.00 a year. All other countries, $15.00 a year, payable in advance. Entered as second class matter August 29, 1938 at the Post Office at Albany, N. Y., under act of Mar. 3, 1879. Printed in U. S. A.

© Copyrighted 1957 by McGraw-Hill Publishing Co. Inc.—All Rights Reserved.

SUBSCRIPTIONS: Send subscription correspondence and change of address to Subscription Manager, Electrical Construction and Maintenance, 330 West 42nd Street, New York 36, N. Y. Subscribers should notify Subscription Manager promptly of any change of address, giving old as well as new address, and including postal zone number, if any. If possible, enclose an address label from a recent issue of the magazine. Please allow one month for change to become effective.

Sidelights

CHRISTMAS GREETINGS–Many of our readers will recognize at once the much travelled countenances which Art Editor L. E. Devendorf has gayly caricatured for the season's greetings of the editorial staff on the cover this month. In case you don't

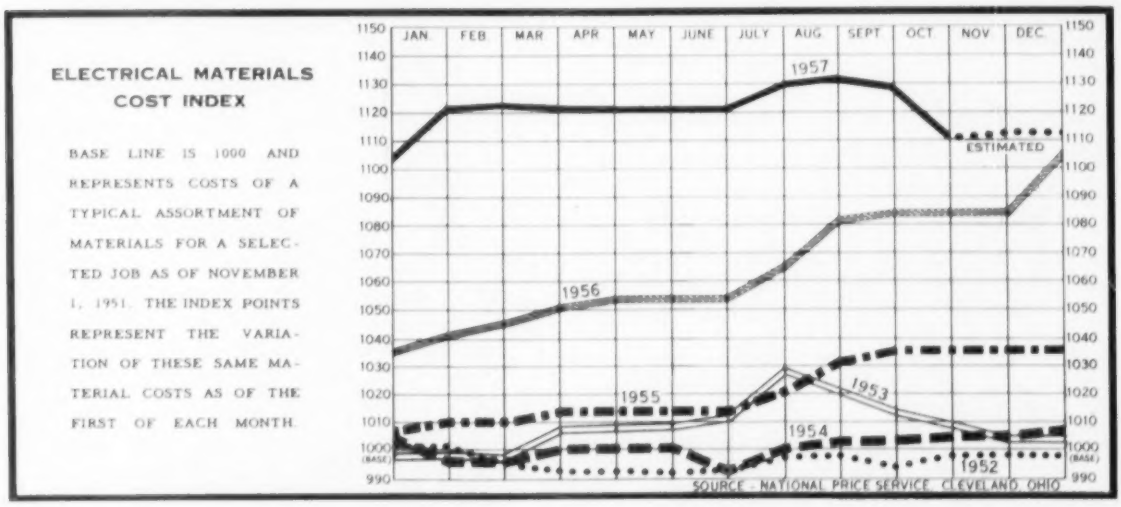
know them all, the little chart will help you identify them as follows: 1. W. T. Stuart, 2. Alice McMullen, 3. August Eckel, 4. Berlon C. Cooper, 5. J. F. McPartland, Jr., 6. H. P. Scott, 7. Wm. J. Novak, 8. L. E. Devendorf, and 9. Wm. J. Martens.

VANDAL ALARM–Our lead editorial in the October issue, "New School Alarms", described a fire detection system and a new sound surveillance type of vandal alarms for school buildings. The editorial brought an unusually large number of inquiries, particularly about the vandal alarm system. We regret that we do not yet have complete details of the installation mentioned; however, Engineering Editor J. F. McPartland, Jr. is following the project which is scheduled for completion shortly after January 1. We expect to have a full report on this important new system for the February issue.

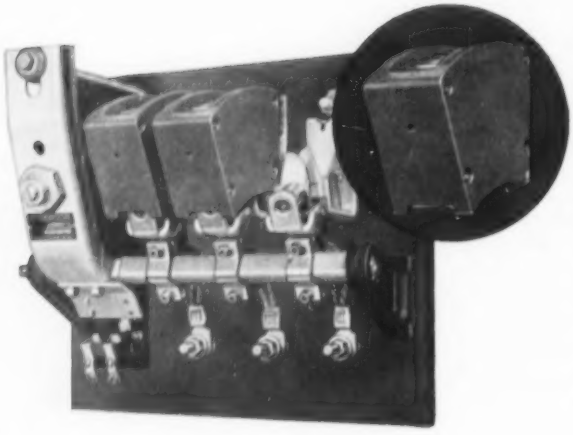
THE WINNERS–The 1957 International Lighting Competition drew a total of 244 entries from the U.S., Canada and several foreign countries. The judges selected the winners on November 4 and 5 and they were notified shortly after. Contest Chairman B. C. Cooper has prepared the official report for this issue. See "Winners in Lighting Competition," page 74.

LOW-VOLTAGE CONTROL–Remote-control switching of residential lighting and appliance circuits is one of the relatively new developments in electrical wiring contributing to today's greater living comfort and convenience. Development of low-cost, reliable system components has resulted in an extension of their use to light industrial and commercial applications. "Low-Voltage Switching–what it is, how it works", beginning on page 88, discusses in detail all such equipment currently available.

MODERNIZATION–The Richfield Oil Corporation's west-coast customer-service center in Los Angeles is noticeably modern all of the way from dual service entrances to quality lighting treatments, underfloor- and trolley-duct systems, air conditioning and multiple voltage provisions for the operation of considerable high-capacity IBM equipment. Surprising, however, is the fact that this smart-looking electrically-progressive office structure is not a new building, but is a quarter-century-old garage-showroom which was extensively modernized architecturally as well as electrically in order to meet the competitive challenge of newer commercial buildings bidding for tenant favor along prestige-conscious Wilshire Boulevard. The "whys" behind this modernization program, plus the "how-to" methods used by Newbery Electric while business proceeded "as usual" as the work progressed, are discussed in "New Lease on Life" on page 84.

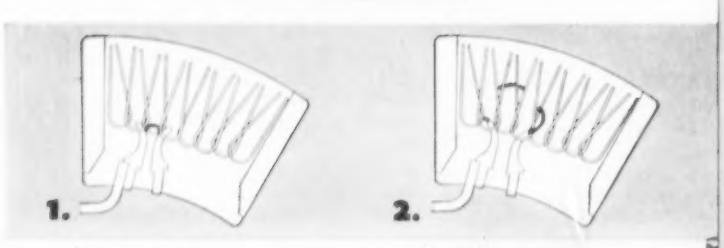


for fast arc interruption... without blowout coils



ALLIS-CHALMERS
TYPE 425 CONTROL
featuring ACBO arc-centering blowout chutes for 50 to 400 hp

The advanced electrical design of Allis-Chalmers Size 4, 5 and 6 control incorporates a modern principle of arc interruption for low voltage, high horsepower applications. The *ACBO* arc chute utilizes principles of magnetic action and thermal convection to center, rupture and extinguish the arc . . . quickly. Fast arc interruption assures maximum contactor efficiency, improves performance — greatly prolongs contact and chute life.

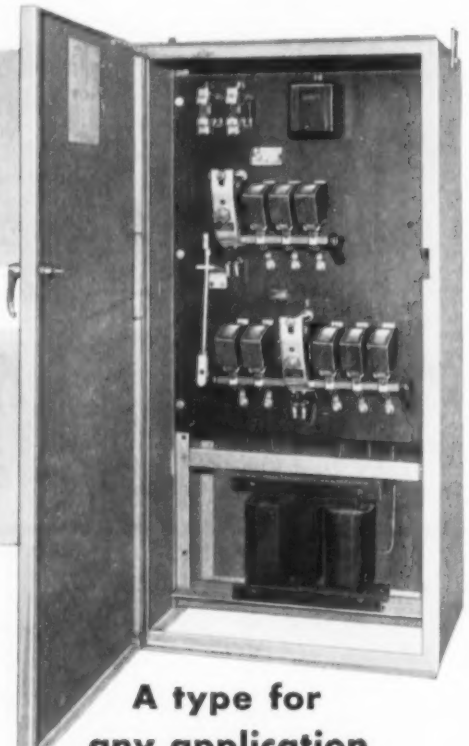


Arc across contacts as they start to open.

Strong blowout action forces arc to center.

Arc rupturing.

Contacts fully open— arc extinguished.



Simplified mechanical design

- Streamlined clapper-type construction eliminates many parts.
- Accessibility simplifies maintenance and inspection.
- Installation is fast and easy . . . sensible enclosure dimensions provide ample wiring space.

A type for any application

Type 425 control offers a wide selection of starters and contactors for any application. For detailed information, call your A-C Control Distributor or your local A-C District Office . . . or write Allis-Chalmers, General Products Division, Milwaukee 1, Wisconsin. Ask for Bulletin 14B8615.

A-C ALLIS-CHALMERS

ACBO is an Allis-Chalmers trademark.

A-5343

ALLIS-CHALMERS

Washington Report

Government officials admit a business slowdown as most of the major indices that measure economic activity turned downward early in the third quarter. Six strong factors in the economy turned unfavorable, and two showed improvement—a representative reflection of what was happening.

Industrial production dropped to FRB index of 142 in October; capital expenditures showed a slight decline for 4th quarter; unemployment increased in October; new manufacturing orders dropped in last half of this year; personal income declined slightly in October; and retail sales declined in September.

Housing starts showed strength in October, reversed the declining trend of the past several months, and government spending continued its upward climb, with prospects for continued expansion as a new and stepped-up program for guided missiles and military defense shaped up.

New construction spending in 1958 will rise about 5% over the 1957 record, Departments of Commerce and Labor estimate. This will represent a $2.4 billion expansion over 1957's record $47.2 estimated expenditure, which will occur chiefly in residential building and highway work. (See EC&M "1958 Forecast" in January for complete details).

October expenditures for new construction totaled $4.5 billion, a record for the month. This was down $100 million from the September $4.6 billion total.

Housing starts in October rose to 95,000 units from September's 90,000 units, and hit an annual rate of one million units. Public housing, with 8,000 units, represented an unusually large volume for the month, and was considered responsible for the change in trend.

The Federal highway building program is off to a good start, with 943 projects covering 2,576 miles of interstate roads completed, under construction, or advertised, during the first 16 months of the 13-year program, it was reported recently by U. S. Bureau of Public Roads.

Credit restrictions were eased November 12 when the Federal Reserve Board lowered the discount rate a full ½%, from 3½% to 3%. With the FRB Index at 142 for October, lowest level for 15 months, the action revealed FRB awareness of business tremors.

Enrollment for engineering studies reached a record last fall, with 277,052 students enrolled in U. S. colleges and universities, U. S. Office of Education reports. The freshman engineering class of 77,738 was second largest in history.

Cost of living leveled off in October at a consumers price index of 121.1% of the 1947-49 average, after a 13-month period of monthly gains. The upturn began in February 1956 at 114.6 and has shown gains each month except for July 1956 when there was a slight drop of 3%.

Electric power output rallied early in fourth quarter to show weekly gains over similar period a year earlier of 3% to 5%. Production in mid-November was at weekly rate of 11.953 billion kwhr.

Personal income in October dropped from September rate, but still exceeded the year-earlier total. The annual rate in August was $346.8 billion; in September, $346.5 billion; and in October, $345.5 billion, Commerce Dept. reported. The annual rate in October 1956 was $334.0 billion, or 3½% less. The decline from September to October reflected reductions in employment and hours worked per week, while average hourly earnings remained at record levels.

REVERE ULTRA-LITES and "4200" SERIES FLOODLIGHTS *give even, shadowless illumination to this outstanding new super-service station. Ultra-Lites form square shaped light patterns which overlap to eliminate "dark spots". Service area illumination is 25 average foot candles, with a ratio of about 2 to 1 overall. In addition to advanced lighting, Ultra-Lites are themselves styled with an "advanced look" that adds much to the modern layout and architecture of the site.*

Revere Ultra-Lites are right for Chicago's "Auto World"

Revere has the right fixtures for your job too

Bright, even lighting is required by this large new service station to highlight its many services to the passing motorist. Revere Ultra-Lites were chosen because of their even, shadowless illumination.

For your job, too, you can select the exact components you need from Revere — because Revere has the widest line of matched fixtures for outdoor lighting. You can plan your installation with the assurance that all components will "fit" together in assembly. By ordering from one source, you are assured of well planned, complete deliveries to coincide with your job schedule.

Ask your electrical wholesaler to show how Revere fixtures can make your next outdoor lighting installation a more easily planned, more effective job.

Write for Revere's complete Catalog.

Revere ELECTRIC MFG. CO.

Revere Electric Mfg. Co., 6009 Broadway, Chicago 40, Ill., UPtown 8-7100

Available in Canada thru Curtis Lighting, Ltd., Leaside, Toronto, Ontario

OUTDOOR LIGHTING: Industrial • Commercial • Service Stations • Streets • Sports • Airports • Shopping Centers

BASIC RESEARCH . . .
More Practical Than You Think

This editorial, one of a special series on the importance of research to the American economy, deals with an aspect of our research program that may have serious consequences in future years — the lag in basic research.

An earlier editorial in this series noted: "The keen interest of U. S. business firms in scientific research points the way to a new kind of prosperity for our economy — a prosperity based on deliberate creativeness." As a result of the dramatic increase in industry's research expenditures, more new products will be introduced in the years 1957-1960 than in any previous four-year period.

A steady stream of new products and new processes means better values for consumers and lower costs for business. And thus it promises to sustain a high level of general prosperity that defies the old laws of boom and bust. **But, as we look further ahead, there is a danger that the stream of research discoveries may run dry because of our neglect of basic research.**

This danger was described by John Jay Hopkins, late founder and chairman of the General Dynamics Corporation: "Unless there is a revolutionary development in America of pure, not applied, science, there will come a day when there is no use in trading in your old car; because the new one is no better. The only difference between this year's television set and next year's will be the appearance of the cabinet! Scientific progress will be replaced by scientific stagnation."

What Basic Research Is

Basic (or pure) research has been characterized as the pursuit of knowledge for its own sake rather than to fulfill some practical objective. It is generally carried out in an environment which allows the investigator the freedom to follow the lead of his curiosity. The scientist in basic research, in the words of Glenn T. Seaborg of the University of California, is not concerned with "utilitarian goals, but a search for deeper understanding of the universe and the living and inorganic phenomena within it."

Impractical as basic research may seem in its initial purpose, it is an essential prerequisite to applied research and product development. A few examples will show how some of the greatest technical advances of recent years have come from basic research projects that had no immediate practical objective:

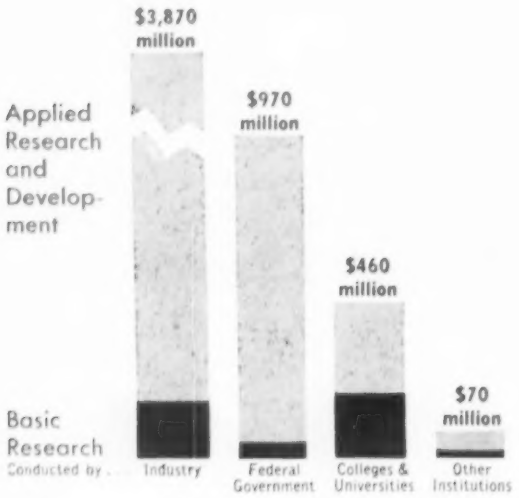
- **Radar** – an important military development of World War II with broadening commercial applications – was the outgrowth of a basic research project whose purpose was to obtain information about the height of the ionosphere, the layer of air that lies some 25 miles above the earth's surface.

- **Transistors** – the miniature devices which are already vital components of hearing aids, pocket radios and a wide variety of industrial equipment – were invented at Bell Laboratories (research subsidiary of the American Telegraph and Telephone Company) following university investigations into the electrical behavior of solids.

- **Neoprene** – a synthetic rubber – was developed by dul'ont with the help of basic information provided by Father Nieuwland of Notre Dame, who discovered he could control the polymerization (the linking together of molecules) of a certain class of organic compounds.

- **Nylon** – the first of the noncellulosic synthetic fibers that have revolutionized the textile industry – grew out of fundamental research by Dr. Wallace Carothers on long-chain polymers.

Only 8% of All Research and Development in the U. S. is Devoted to Basic Research



Data: National Science Foundation, "Funds for Basic Research in the United States, 1953"

Industry's Stake in Basic Research

Industry traditionally has relied upon colleges and universities and other nonprofit institutions for basic research; and the U. S. has long benefited from the greater emphasis placed on basic research in Europe. It is conventional to think that business cannot, and should not, do much about "ivory tower" projects which do not have immediate practical application.

However, there is not so much in this idea as is supposed. The examples above illustrate what Caryl Haskins, president of the Carnegie Institution, has called "the widespread paradox that the most important practical consequences are commonly the least sought after." Furthermore, it is certain that, without adequate basic research, industry's efforts to produce new and better products will become progressively more difficult. And our national defense, in an age of breathtaking military applications of science, will become increasingly precarious.

In the past, our economic growth came largely through expansion into new lands or through discovery and development of rich deposits of natural resources. Such opportunities are relatively limited today. The great opportunities now lie in discovering new materials and new properties of the materials we already have. **This is the job of basic research, and industry has a vital stake in it.**

The chart indicates the tiny share of research efforts in the U.S. that is devoted to basic research. **Only 4% of all research by industry, and only 8% of all research in the U.S., during the year 1953** (the latest for which information is available) **represented fundamental research to add to overall scientific knowledge.** Even in colleges and universities less than half the research performed is basic research. At least one Nobel Prize winner has expressed the belief that we need and should work toward a doubling of the proportion of our total research effort that is devoted to basic research as soon as possible.

What Business Can Do

Without anything like a staggering increase in the total cost of its research programs, industry could do much to expand our basic research effort. Companies with big research programs should, as a matter of successful survival, be devoting a share of the effort in their own laboratories to basic research. Significantly, companies that are already doing a notable job of basic research have also made an outstanding record of translating such research into new products for industry and the consumer.

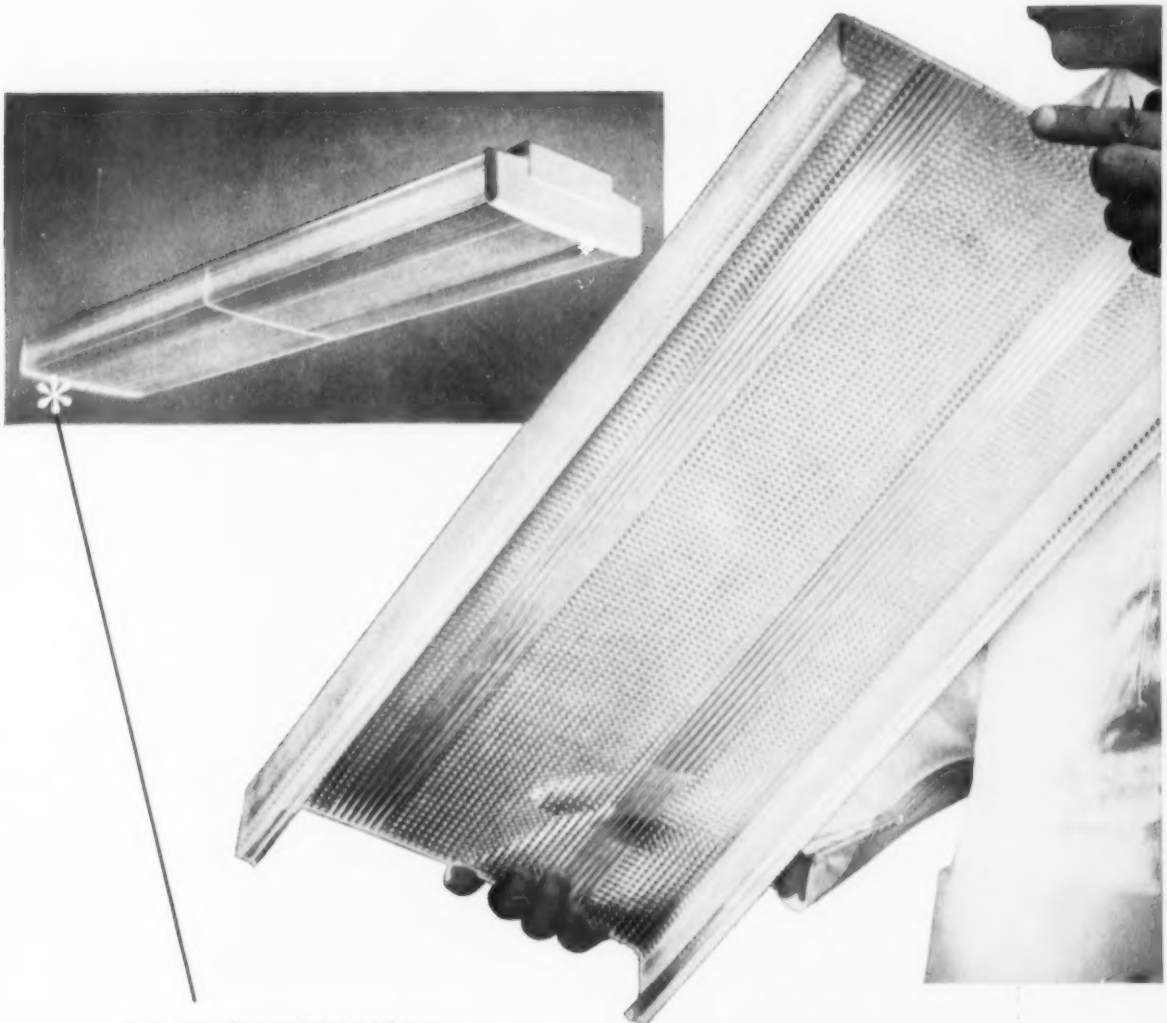
Smaller companies may rightly regard the conduct of research projects with uncertain prospects of reward as a luxury. Some basic research, indeed, never results in any tangible payoff. But, with modest contributions, small companies can still have a part in the advance of basic research. They can join together with other companies on cooperative projects. They can support basic research through trade associations and technical societies. They can help research centers in universities and other nonprofit institutions. Arrangements are available in some instances whereby business firms can pay a fee to have access to work done by university researchers.

One way or another, it is up to private business firms to see that basic research moves forward. By doing so they will be laying the groundwork for the development of the new products and technology on which their growth, and the growth of the economy, depend.

This message is one of a series prepared by the McGraw-Hill Department of Economics to help increase public knowledge and understanding of important nation-wide developments. Permission is freely extended to newspapers, groups or individuals to quote or reprint all or parts of the text.

Donald C. McGraw
PRESIDENT

McGRAW-HILL PUBLISHING COMPANY, INC.



new luminaire . . .

with light-control lens of Plexiglas

Molded of PLEXIGLAS® acrylic plastic, the prismatic enclosure of this recently introduced fluorescent luminaire contributes many basic design advantages:

Light Weight and Strength make possible a simplified design notable for the absence of heavy metal framing . . . resulting in slim, compact, architecturally harmonious appearance. The entire lens section is hinged, can be swung down for easy relamping and cleaning.

Shatter Resistance makes the luminaire especially suitable for locations where safety is a prime requisite.

Precise Moldability to the lens pattern results in an efficient optical element that provides a high level of downward light and, at the same time, complete visual comfort.

Dimensional Stability and Freedom from Discoloration insure long term efficiency, beauty and economy.

Write today for the names of manufacturers of fluorescent luminaires featuring molded PLEXIGLAS enclosures.

Chemicals for Industry

ROHM & HAAS COMPANY

WASHINGTON SQUARE, PHILADELPHIA 5, PA.

Representatives in principal foreign countries

Canadian Distributor: *Crystal Glass & Plastics, Ltd., 150 Queen's Quay at Jarvis Street, Toronto, Canada.*

YOU DON'T NEED A "ROAD MAP"

1-POLE
15-50 Amps

2-POLE
15-70 Amps

3-POLE
15-50 Amps

Write for the complete story
Square D Company,
6060 Rivard Street, Detroit 11, Michigan

EC&M HEAVY INDUSTRY ELECTRICAL EQUIPMENT...NOW A PART OF THE SQUARE D LINE

SQUARE D COMPANY

TO USE THE QO® BREAKER!

NO GUESS-WORK!

There's just ONE ARRANGEMENT. 2-pole breakers go anywhere on the bus assembly. You don't need a wiring diagram to tell you where to put them. And there's no limit on the number of 2-pole breakers you can use. The same applies on 3-pole breakers for 3-phase jobs.

ONE FULL-SIZE BREAKER!

Each pole in its own case and all poles are the same size. Double-pole breakers take only two single-pole spaces—3-pole breakers only three. No more.

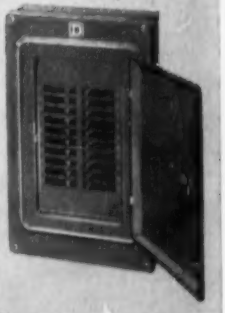
LESS MONEY TIED UP IN STOCK!

Only one kind of breaker for all load centers—*no duplicate stocks.* The same breaker for panelboards —*no duplicate stocks.* This is true for all the ampere ratings in 1-pole, 2-pole and 3-pole breakers. Incidentally, the 3-pole breaker comes in mighty handy for 3-phase air-conditioning loads, because it fits on the same bus. No separate box needed.

NAME THE JOB AND THE QO CAN DO IT—*EXACTLY*

Panelboards
1-Phase or 3-Phase
Lugs or Main Breaker
14" or 20" wide boxes
4" or 5¾" deep

Column Panelboards
1-Phase or 3-Phase
Lugs or Main Breaker
with 1, 2 and 3-pole branches



Load Centers
1-Phase or 3-Phase
2 to 42 circuits
Lugs or Main Disconnect
Service Entrance—
Split bus type

Raintight Enclosures
2 through 30 circuits

AND HERE'S THE BIG PAYOFF —THERE'S JUST ONE QUALITY!

There's no sacrifice in quality or features to save space. All **QO** breakers, including single-pole, are quick-make, quick-break, temperature corrected and have sensitive magnetic trip to protect against "flash" shorts. Judged on any basis of comparison, the **QO** is the finest breaker ever built!

QO ...*THE "NO CALL BACK" BREAKER*

New Dayton Daily News Building Gets Life-time Wiring Protection With

YOUNGSTOWN "BUCKEYE" STEEL CONDUIT

Electrical wiring system in the new Dayton Daily News Building will be permanently safe from damaging elements such as water, moisture, vapor, dust and dirt because Youngstown's Full Weight Rigid Steel "Buckeye Conduit is on the job 24 hours a day—every day.

If the safe and efficient operation of your electrcial systems—in any location— poses a problem, then Youngstown "Buckeye" Conduit should be your specification. Field reports relate: "It's easier to bend and thread—easier to fish wires through and because of its superior corrosion resistance, provides a much longer, trouble-free service life."

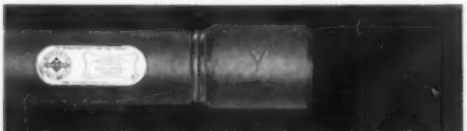
Remember, because Youngstown is the only producer of rigid steel conduit controlling all processes from ore mining to finish threading, you can be certain each length contains the same high quality that has made it the accepted standard of leading owners, architects and contractors everywhere.

Our Distributor's complete and ample stocks will help keep your jobs on schedule—and cover emergency needs whenever they arise. Why not call today for prompt and efficient handling of your next conduit order.

Dayton Daily News Building, Dayton, Ohio
Design and construction by The Austin Company, Cleveland, Ohio
Electrical Contractor: The Wagner-Smith Company, Dayton, Ohio
Conduit Supplier: Westinghouse Electric Supply Co., Dayton, Ohio

QUALITY YOUNGSTOWN SERVICE

THE YOUNGSTOWN SHEET AND TUBE COMPANY
Manufacturers of Carbon, Alloy and Yoloy Steel
General Offices - Youngstown 1, Ohio
District Sales Offices in Principal Cities



Standard-threaded rigid steel conduit is the only wiring system approved today by the National Electrical Code as moisture-, vapor-, dust- and explosion-proof for use in hazardous locations and occupancies.

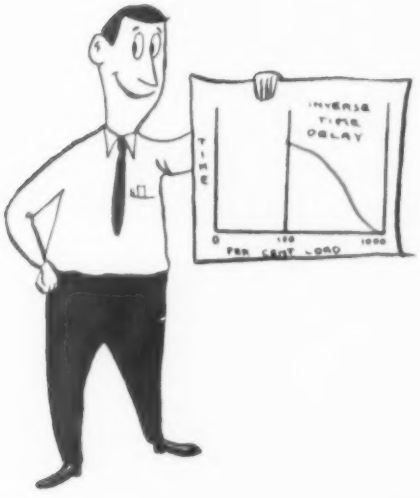
ONLY HEINEMANN CIRCUIT BREAKERS give you all THREE

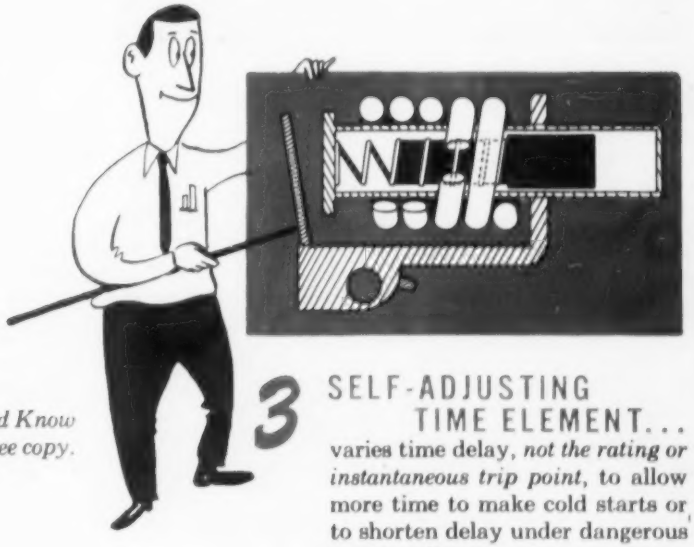
1 A DEFINITE RATING . . .

unaffected by temperature. A 20 ampere rating means 20 amperes of safe, usable capacity. There is no de-rating of Heinemann Circuit Breakers.

2 INVERSE TIME DELAY . . .

prevents nuisance power interruptions . . . permits starting inrush and harmless, temporary overloads. Gives maximum protection without inconvenience.





INFORMATIVE BOOKLET: *"What You Should Know About Circuit Breakers"... Send for your free copy.*

3 SELF-ADJUSTING TIME ELEMENT . . .

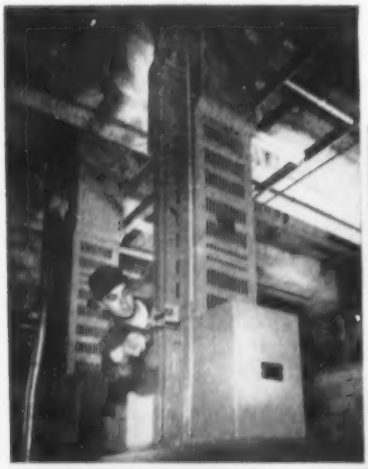
varies time delay, *not the rating or instantaneous trip point,* to allow more time to make cold starts or to shorten delay under dangerous heat conditions.

HEINEMANN *Circuit breakers*

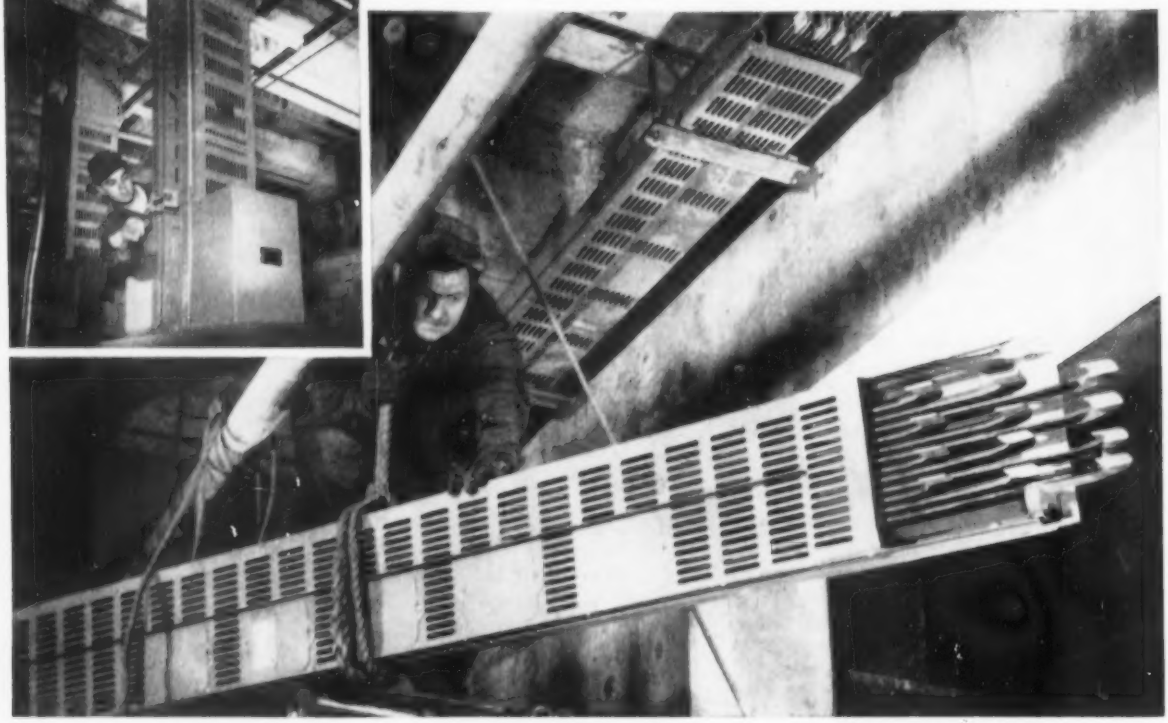
HEINEMANN ELECTRIC COMPANY
132 PLUM STREET
TRENTON 2, N. J.

Over 3½ miles of aluminum busways

supply power to new 34-acre Chrysler stamping plant



General Electric Type LVDP plug-in feeder busway with aluminum bars.



Ohio Stamping Plant, Chrysler Corporation, Twinsburg, Ohio
Architects and Engineers—F. A. Fairbrother & George H. Miehls
Architects and Engineering Consultants—Albert Kahn Associates
Construction—Hunkin-Conkey Construction Company
Mechanical Work—Robert Carter Company
Electrical Contractors—Hatfield Electric
Busways—General Electric Company

Largest Plant of Its Type in U.S.A.

This modern new plant incorporates 28 major lines of presses and subsequent welders that produce almost 300 different stampings and assemblies for all Chrysler Corporation cars. The entire plant area is covered with networks of different types of busways. Light-duty, 50-ampere plug-in busways serve the fluorescent lighting load.

Plug-in busways in ratings of 400 and 600 amperes, braced for a 50,000 ampere short-circuit current, serve the motor loads and general factory requirements.

New 1,600-ampere (type LVDP) low voltage drop plug-in busways supply the heavy welding loads, as well as the heavy press loads. Power is distributed at 480v. The plant load comprises 50,000 hp connected motor load and almost 30,000 KVA of welder loads.

Aluminum Busway Systems Save Money

In addition to the lower initial cost of aluminum busway, the use of lightweight aluminum bus bars makes each section of busway easier to handle and easier to install. More and more users of packaged electrical distribution systems are finding that Alcoa® Aluminum Bus Conductor offers advantages of lower cost, availability and design flexibility. Aluminum distribution bus weighs considerably less than a copper system of equal conductivity. Pound for pound, it has greater current-carrying capacity than cable in conduit and costs less.

Alcoa Aluminum Can Serve You, Too

Wherever your production requirements demand an efficient, flexible electrical distribution system, it will pay you to specify busways with Alcoa Aluminum Conductors. Write us for the names of manufacturers who specialize in this lighter, better, more economical product. Aluminum Company of America, 2302-M Alcoa Building, Pittsburgh 19, Pennsylvania.

Your Guide to the Best in Aluminum Value

NEW! "ALCOA THEATRE"
Exciting Adventure
Alternate Monday Evenings

NOW, From General Electric . . .

A MAJOR INNOVATION IN SWITCH AND FUSE EQUIPMENT DESIGN

General Electric's new load-break Rollout Switch and Fuse equipment—available in 2.4, 4.8, 7.2, and 13.8 kv and with a high momentary rating—provides maximum safety for your personnel, plant, and equipment.

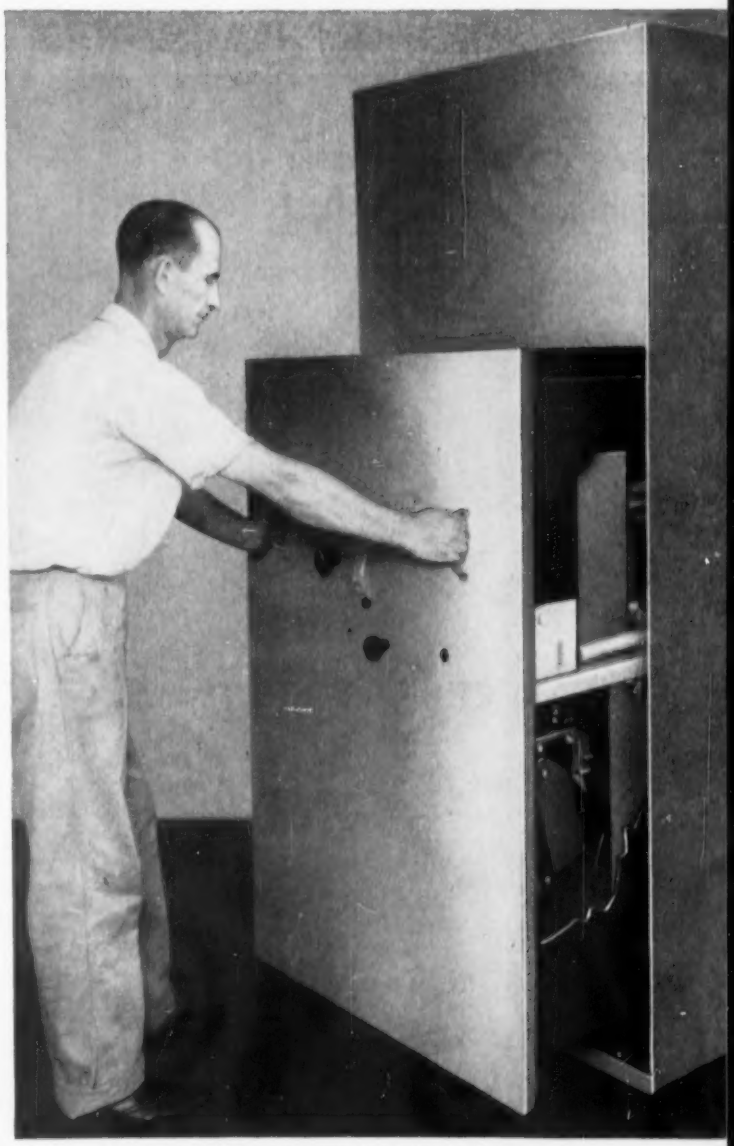
SAFER, BETTER CLOSING against full momentary current is provided with the new General Electric equipment by a stored energy closing mechanism.

MAXIMUM SAFETY for inspection and maintenance is provided by the rollout feature of the new General Electric equipment.

MAXIMUM PROTECTION is built into General Electric's equipment through a time delay interlock that prevents immediate re-opening of the switch after closure. This allows time for the fuses to function if the switch has been closed against a fault.

MAXIMUM VERSATILITY is possible with General Electric's Rollout Switch and Fuse because the equipment is available as an indoor or an outdoor unit. Either type can be furnished single, multiple, or in a line-up with metal-clad switchgear.

FOR MORE INFORMATION contact your General Electric Apparatus Salesman, or write to Section 511-27, General Electric Company, Schenectady 5, New York.



ROLLOUT FEATURE simplifies maintenance. Insulation is shown cutaway to give position of switch and fuse elements.

Progress Is Our Most Important Product

GENERAL ELECTRIC

compact . . . power packed

New General Electric

GREATER

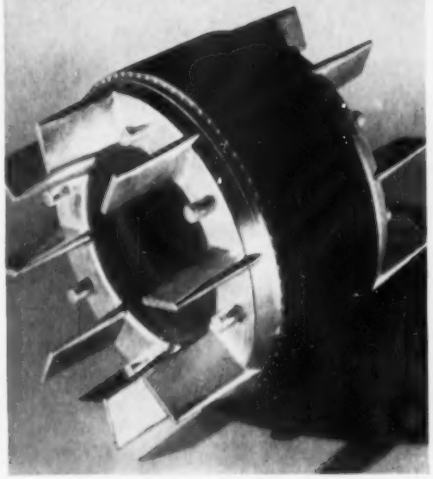
AUTOMATED TESTING FACILITIES check Tri-Clad '55' motors to assure conformance with high G-E manufacturing standards.

TRI 55 CLAD Motors Offer . . .

RELIABILITY

NOW AVAILABLE THROUGH 125-HP

MORE EFFECTIVE INSULATION—New Mylar* polyester film slot and phase insulation gives Tri-Clad '55' stators up to 8 times more protection than conventional types. Formex® wire gives protection against heat aging.



MORE EFFICIENT ROTORS—Revolutionary new double-entrance centrifugal casting technique is utilized on rotors for new larger ratings—up through 125-hp. Solid castings result, helping to prevent localized heating.

MORE FULLY PROTECTED ENCLOSURES—Tri-Clad '55' motor frames and end-shields are cast-iron constructed to provide rigid support and corrosion resistance. Cast-in louvers help protect against contaminant entrance.

immediate shipment . . . all ratings

To cost-conscious motor users, greater equipment reliability means both immediate and long-run cost reductions. In the immediate future, it minimizes profit-robbing downtime and cuts maintenance costs; and, in the long-run, it reduces replacement costs because motors last longer.

Now, to provide increased reliability for motor users, General Electric offers a complete line of Tri-Clad '55' motors—up through 125-hp—designed to new NEMA space and weight-saving dimensions.

QUALITY CONSTRUCTION GIVES GREATER RELIABILITY—New materials and manufacturing techniques—such as those described above—are used in the production of Tri-Clad '55' motors to give added service life, with fewer breakdowns and reduced maintenance.

But, greater reliability is not the whole Tri-Clad '55' motor story. G-E engineers have also designed these new motors to provide easier installation, and reduced shipping, handling and storage costs. And, you can get *immediate* shipment—usually from warehouse stocks—of any popular Tri-Clad '55' motor rating, up through 125-hp.

FOR COMPLETE INFORMATION on the new line of Tri-Clad '55' motors, contact your nearby G-E Apparatus Sales Office or Distributor. Send in the attached coupon for free Tri-Clad '55' motor bulletins.

*Reg. DuPont Co. Trademark

Section C891-9
GENERAL ELECTRIC COMPANY
Schenectady 5, New York

Please send me the following publications:

☐ **FREE BULLETIN (GEA-6602) describes advanced features of new Tri-Clad '55' motors through 125-hp.**
☐ **FREE SLIDE RULE (GEN-148) to determine weight and space-saving benefits of new Tri-Clad '55' motors.**

NAME .....

TITLE .....

COMPANY .....

ADDRESS .....

CITY & STATE .....

Progress Is Our Most Important Product

GENERAL ELECTRIC

Reflecting Modern Power Distribution Techniques...

COMMERCIAL
POWER
DISTRIBUTION

12 KV POWER feeds metal-clad switchgear ❶ consisting of one incoming, two feeder breakers. It then goes to 225-kva load center unit substation ❷ serving data process center; 750-kva unit ❸ for motor control center, 277-v lighting, computer air conditioning; 500-kva unit ❹ supplying 120-v office and cafeteria equipment, lighting. Two units—500 and 1000 kva—placed elsewhere, supply building's heating, air conditioning and office area loads.

New Fireman's Fund Building Utilizes General Electric 480Y/277-Volt System

System-engineered equipment achieves large savings, aids efficient operation of insurance firm home office

DESIGNED FOR EMPLOYEE EFFICIENCY AND COMFORT, the Fund Insurance Company's new home office is a dramatic addition to San Francisco's skyline. High-level lighting, year-round air conditioning, 190,000 sq. ft. of flexible office space, modern business machines, and built-in design features permit a 900-member staff to handle The Fund's operations smoothly, efficiently.

LARGE SAVINGS were achieved by adopting a General Electric 480Y/277-volt power distribution system for combined light and power loads. Due to higher voltages, smaller conductors and fewer wiring circuits were possible, and separate lighting power supply substations were eliminated. Added values: flexibility features of G-E 480Y/277-v systems provide capacity to handle future load growth; equipment economies were provided by using primary power and unit substations. Interrupting capacity at any point of the secondary circuits was lower than that possible with direct connection to a secondary system.

PROJECT TEAMWORK facilitated installation and startup of the electrical system. Working closely with officials of The Fund and their consultants*, G-E engineers conducted a system analysis early in project planning. General Electric also recommended basic system layout, provided service engineering and installation assistance at the site.

GENERAL ELECTRIC SYSTEM ENGINEERING CAN HELP YOU on your construction project. G-E engineers are available at all times to assist you and your consultants in planning your electrical system. Contact your nearest G-E Apparatus Sales Office or write General Electric Co., Section 680-13, Schenectady 5, N. Y.

* Architect: Edward B. Page, A.I.A.
Electrical Engineer: Clyde E. Bentley
General Contractors: MacDonald, Young & Nelson, Inc.
Electrical Contractor: Ets-Hokin & Galvan

Engineered Electrical Systems for Commercial Buildings

GENERAL ELECTRIC

PROJECT PLANNERS N. A. Begovich, Fireman's Fund official; Edward B. Page, architect; F. N. Blum, G.E.; Clyde E. Bentley, consulting engineer; J. M. Ets-Hokin, electrical contractor.

GLARE-FREE 277-V FLUORESCENTS in unique fixtures achieve ideal brightness ratio for office areas, create savings by combined lighting system, power source.

PROJECT POWER serves G-E 12 kv metal-clad switchgear lineup of main, two outgoing breakers to five unit substations.

OPERATING EASE, reliability of G-E drawout switchgear with AK-1 breakers provide safer switching of 480-v feeders.

500-KVA unit substation, with Pyranol* transformer, serves 120-v needs directly, 480-v loads through 150-kva transformer.

* Registered Trademark of General Electric Co.

And Now!

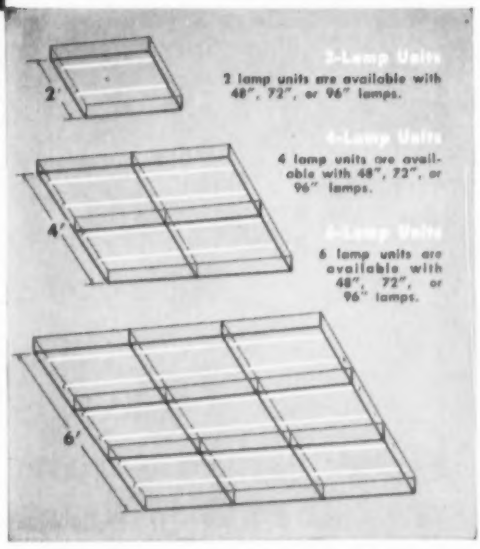
A "Floating Panel" Luminaire

Panelaire

the newest *"pacesetter"* innovation in large area illumination

Provides an even distribution of high level light on the ceiling and "washes" the walls with glare-less illumination free of annoying contrasts.

Panelaire is ideal for offices, classrooms, drafting rooms, display and other areas where high levels of illumination are desirable. It is factory pre-assembled as a single unit, delivered complete in a single carton ready to install. Polystyrene louver diffusers with 45° shielding permit 200 foot-candles of comfortable illumination, easily interchangeable vinyl pan diffusers allow 100 foot-candle intensities. For complete Brochure send coupon below today.


2'
2-Lamp Units
2 lamp units are available with 48", 72", or 96" lamps.
4'
4-Lamp Units
4 lamp units are available with 48", 72", or 96" lamps.
6'
6-Lamp Units
6 lamp units are available with 48", 72", or 96" lamps.

LPI

LIGHTING PRODUCTS, INC
HIGHLAND PARK, ILLINOIS
Dept. 4P
the "pacesetter" in the lighting industry

NAME..... ADDRESS..... CITY..... STATE.....

— FILL IN COUPON AND MAIL TODAY —

the $later 600 mean$ bu$ine$$!

The newest, greatest wall switch for fast, easy installation... quiet as a mouse!

No screws, no posts, no special tools or "knack" needed.

One *or two* #12 or #14 wires slip into bulldog grip clamps through specially designed holes in switch case. Cuts installation time more than 50%!

Patented, instantaneous side release.

Slater

SEA CLIFF AVENUE, GLEN COVE, NEW YORK • ORIOLE 6-1100

WRITE FOR THE SLATER CATALOG. IT LISTS HUNDREDS OF TIME AND TROUBLE-SAVING WIRING DEVICES TO MAKE YOUR JOB EASIER... MORE PROFITABLE.

In this new AMERICAN METER COMPANY plant...

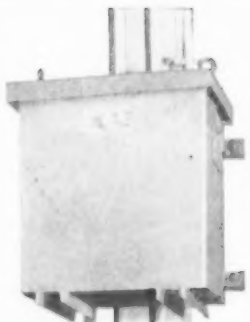
UPTEGRAFF TRANSFORMERS

provide: *dependable design, quality construction, efficient operation, overall economy*

The American Meter Company has ten plants throughout the United States where pressure-measuring meters for water and gas are manufactured. The above new plant is a typical example of how Uptegraff transformers efficiently and with maintenance-free long life serve important industries as well as utilities.

The transformers range from 1000-kva outdoor power transformers, seen on the next page, to the indoor dry-type transformers, below, both overhead and floor mounted. The main outside bank of Uptegraff transformers connects to Philadelphia Electric Company's 33-kv lines. This high voltage is permitted for the use of the industrial company. It reflects the high degree of confidence of the American Meter Company in the design and construction of Uptegraff transformers.

Uptegraff makes a complete line of Power, Load Center, Distribution—overhead and station type, Network, Instrument, and Specialty transformers. Write for Engineering Data *today*.



A typical Uptegraff indoor specialty transformer for overhead mounting. Made by the Terra Alta Division, this dry-type transformer is rated at 30 kva.

R. E. UPTEGRAFF MANUFACTURING CO.

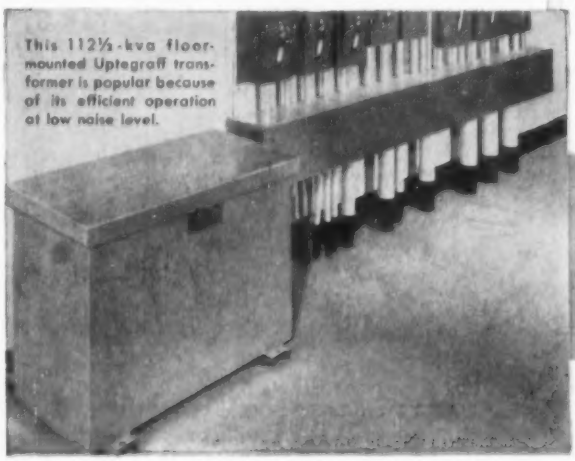
Scottdale, Pennsylvania

Architects and Engineers
George M. Ewing Co.
Philadelphia, Pa.

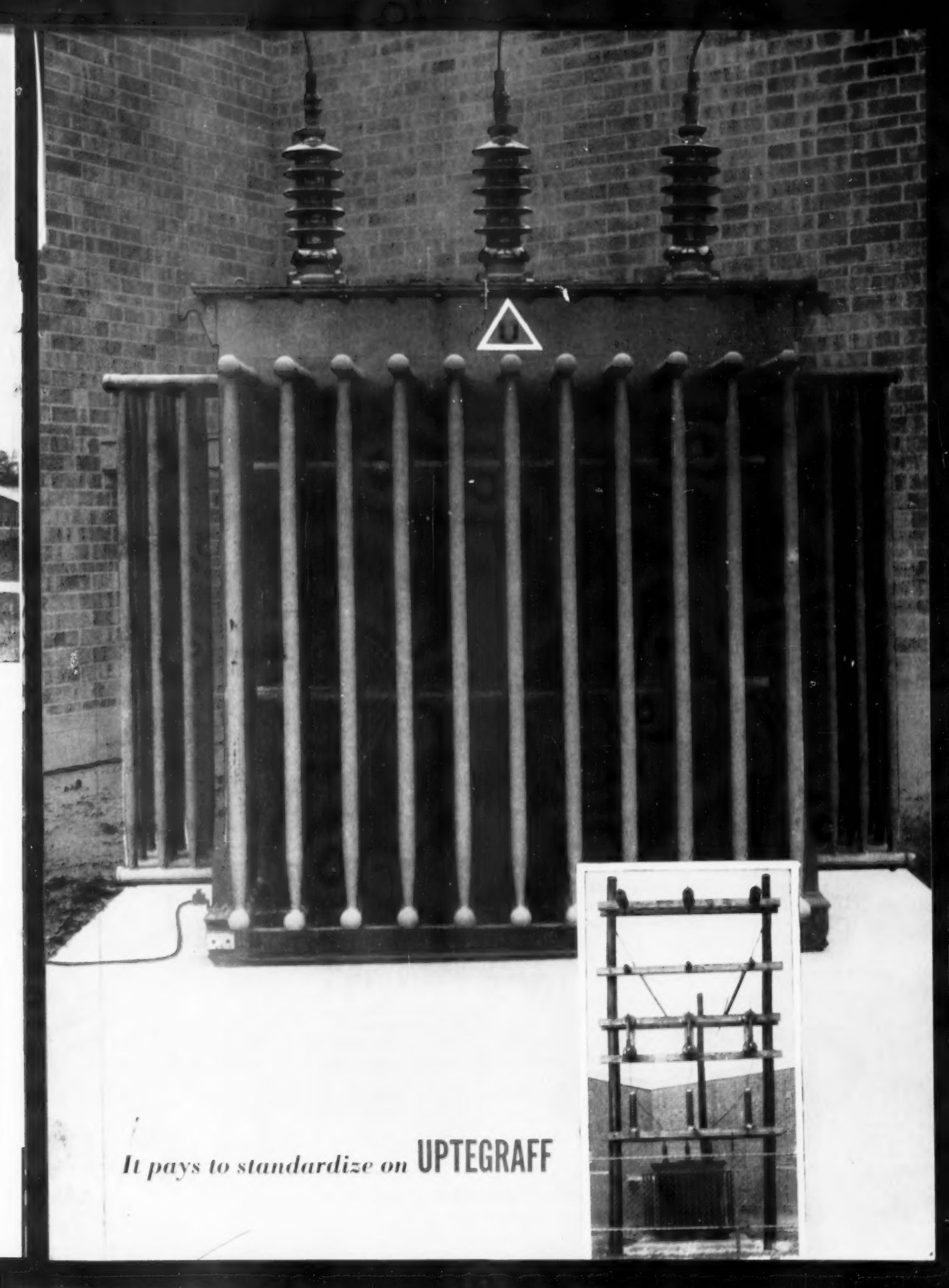
Consulting Engineer
Louis W. Moxey III
Philadelphia, Pa.

General Contractors
Nason and Cullen, Inc.
Philadelphia, Pa.

Electrical Contractor
Seaboard Electric Co.
Philadelphia, Pa.



This 112½-kva floor-mounted Uptegraff transformer is popular because of its efficient operation at low noise level.



It pays to standardize on **UPTEGRAFF**

This shopping center consumes enough electricity to supply 25,000 homes

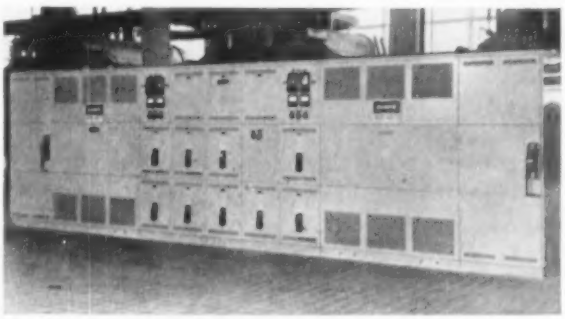
Here are 161 acres of shopping convenience—the Northland Center development of the J. L. Hudson Company in suburban Detroit. The branch department store and some 80 other Northland Center stores use electric power for interior and exterior lighting, elevators, conveyors, escalators, pumps and blowers, and compressors for air conditioning and refrigeration.

So great is this shopping center's demand for electricity that the Detroit Edison Company has built a substation there large enough to supply the electrical needs of 25,000 homes.

Eleven double-ended substations, rated 1500 and 2000 kva, are required to distribute this electric power. Each unit substation is equipped with two Wagner dry-type transformers which meet all requirements for safe indoor installation because they are fireproof and explosion-proof.

Wagner Transformers play an important role in supplying power to many major businesses and industries so they can work better electrically.

Why not discuss *your* next indoor or outdoor transformer installation with a Wagner engineer? Call the nearest of our 32 branch offices, or write us.



This Wagner-equipped Unit Substation is installed in Northland Center utility house for 4800-480 volt power distribution.

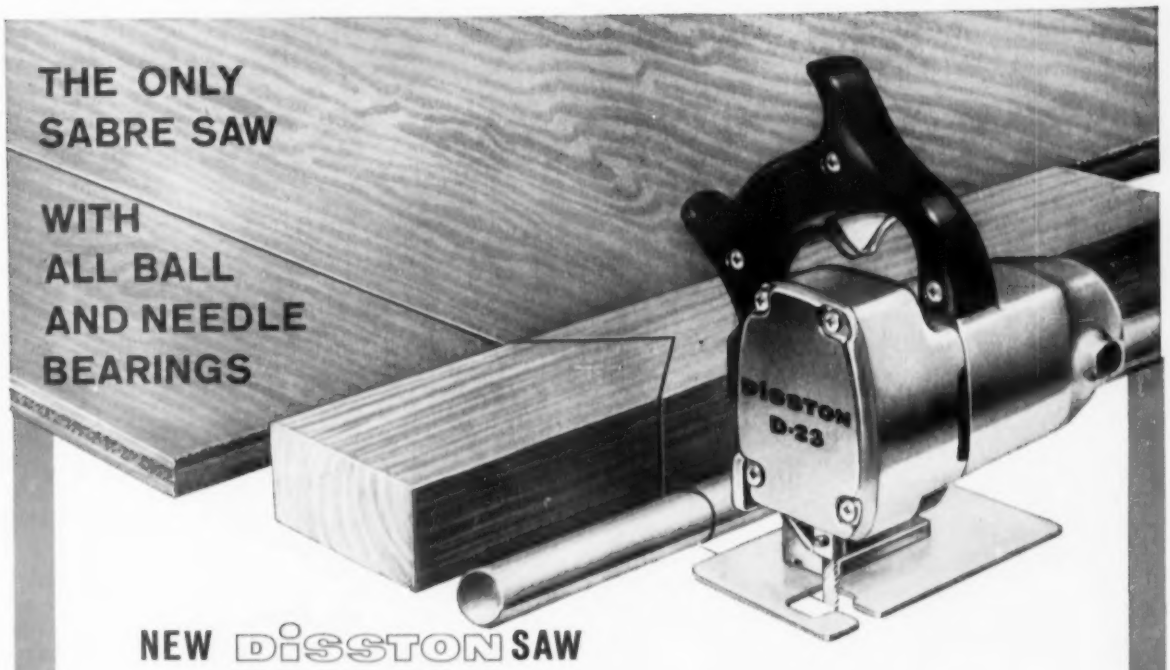
Wagner Electric Corporation
SERVING INDUSTRY SINCE 1891

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

Wagner Electric Corporation
6413 Plymouth Ave., St. Louis 14, Mo., U. S. A.

W157-7

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES • AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC



NEW DISSTON SAW

FASTER THAN ANY OTHER SABRE SAW FOR CUTTING IN METAL, WOOD, PLASTIC

The D-23 Electric Hand Saw offers entirely new features in fast, versatile cutting for professional jobs. Competitive tests prove the D-23 is 15% to 50% faster than all competitive saws. And it's made by DISSTON, a famous name in saws for more than 100 years. Only **$98.50**

"ORBITE" Action gives the DISSTON D-23 Electric Hand Saw its fast, clean cut. It reduces blade wear, too. The blade has an orbital motion (3,800 strokes per minute). It cuts on the up-stroke, moves away from the material on the down-stroke. The result is less fraying of edges, truer cuts on circles, scrolls, straight lines or bevels.

Detachable Cord. The DISSTON D-23 has a detachable bayonet socket electric cord so you can select the cord length of your choice. Extra, easy-to-change blades come with the saw for use in plywood, 2x4's, plank lumber, sheet metal, pipes, tubing and plastics.

H. K. PORTER COMPANY, INC.
Henry DISSTON DIVISION

FREE BOOKLET

Mail this coupon today for an illustrated booklet outlining many other convenient and exclusive features of the DISSTON D-23. Instructions tell you how you can get the most out of your electric hand saw.

H. K. PORTER COMPANY, INC.
Henry DISSTON DIVISION
712 Tacony, Philadelphia 35, Pa.
Please send me without obligation the booklet about the new DISSTON D-23 Electric Hand Saw.
Name _____
Street Address _____
City _____ *Zone* _____ *State* _____

THE RIGHT DI

in design of utility systems is a composite of all that is proven and reliable in the individual components. A close inspection will reveal that generators, transformers, motors, meters, switchgear and controls—so necessary for power generation, transmission and distribution—all utilize AMP for connection and termination on the original equipment you purchase. For added reliability on your own equipment you can demand no less.

Standardize on AMP for generating and sub-station construction and maintenance, communication, panel and switchgear wiring, street and traffic lighting, appliance and meter repair and all other applications where terminals and connectors must produce improved quality, cost reduction and reliable service.

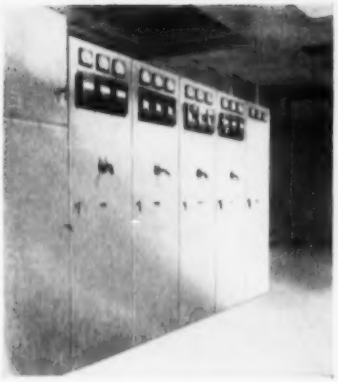
A-MP terminals, when required for maintenance and repair needs, are available in the U.S.A. through American Pamcor Inc. api AMERICAN PAMCOR INC.

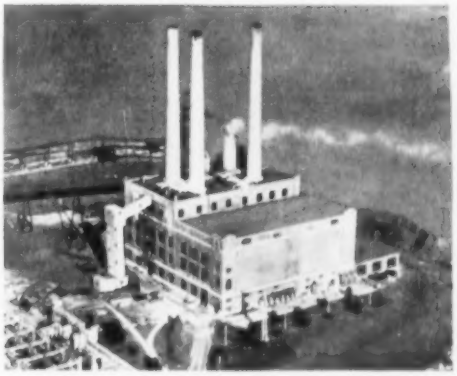
AMP INCORPORATED

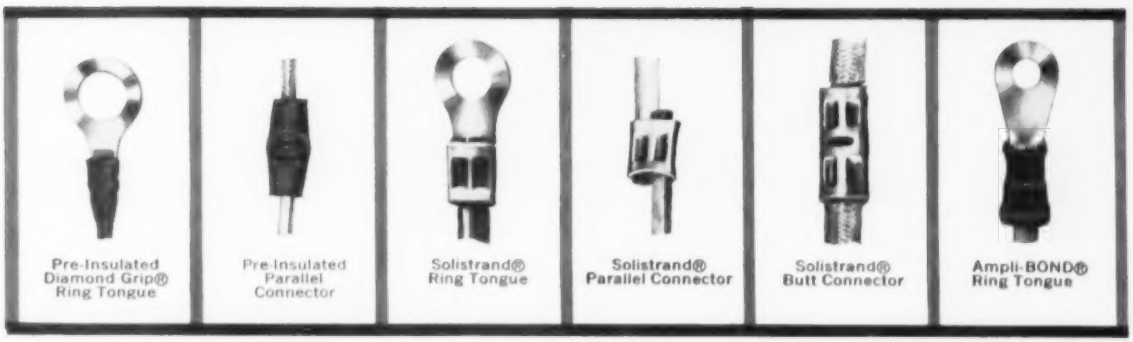
GENERAL OFFICES: 7341 EISENHOWER BOULEVARD, HARRISBURG, PA.

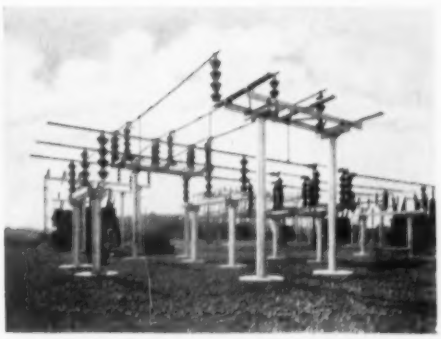
Wholly Owned Subsidiaries: Aircraft-Marine Products of Canada Ltd., Toronto, Canada • Aircraft-Marine Products (Great Britain) Ltd., London, England • Societe AMP de France, Le Pre St. Gervais, Seine France • AMP—Holland N.V. 's-Hertogenbosch, Holland • *Distributor in Japan:* Oriental Terminal Products Co., Ltd., Tokyo, Japan

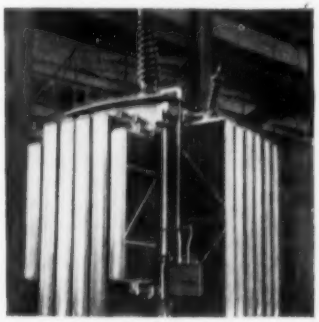
RECTION






Pre-Insulated Diamond Grip® Ring Tongue
Pre-Insulated Parallel Connector
Solistrand® Ring Tongue
Solistrand® Parallel Connector
Solistrand® Butt Connector
Ampli-BOND® Ring Tongue





AMP®

Specify Red "D"® Portable Cord

with "built-in"...

PM

Diamond Type MD® heavy, medium and light duty flexible cordage . . . rubber insulated with rubber or neoprene jacket.

Maximum flexibility, moisture resistant. Conveniently marked to measure!

Diamond DTX® Non-Metallic WHITE Sheathed Cable. Non-sticking, smooth and easy to pull. Clean to handle, does not flake off!

PREVENTIVE MAINTENANCE gets top priority from industrial management . . . so when the job calls for an industrial application of Portable Cord, specify the product with "built-in" PM! Diamond Portable Cord and Red-D-Prene® assure the industrial user maximum protection against costly downtime caused by cord failures. The tough, oil and abrasion resistant sheaths give long wear, reduce maintenance costs. Red-D-Prene, first portable cord produced in Industrial Red, is readily identified . . . thus minimizing accidents.

Trade Mark ®

DIAMOND

WIRE and **CABLE** Company

Sycamore, Illinois

ANDERSON ELECTRIC

Anderson Electric's exclusive Vers-a-groove T-Connectors feature 3-piece design for easy installation . . . 8-bolt construction for controlled clamping pressures and greater contact length . . . reversible clamp for increased cable range and wider application.

ANDERSON ELECTRIC CORPORATION
Birmingham 1, Alabama

Aluminum & Bronze Power Connectors • Clamps • Fittings • Accessories for SUBSTATIONS • TRANSMISSION • DISTRIBUTION

No Glare, No Eyestrain—a Pleasant Atmosphere Thanks to **LITECONTROL** *Low-Brightness Lighting*

Here's another installation which shows the eye-restful effectiveness of Litecontrol low-brightness illumination over a large area. You'll find the fixture that does this functional job (our No. 6044RS 2′ x 4′ troffer with Plexiglas dish diffuser) right in our catalog. It's *standard* — and the cost will appeal to any company or institution seeking good lighting at a sensibly budgeted investment.

The fixture is easy to clean and maintain also. Doors are easy to open by gentle fingertip pressure on "triggers" — and close simply by pushing back by hand. Doors also lift out if desired and may be installed to hinge from either side. No tools are needed.

Yes, Litecontrol can give you or your clients or customers excellent lighting with standard fixtures in *any* type of public building — bank, office, store, plant, school, library — whatever the job.

INSTALLATION: New Britain National Bank, West Main St. Branch, New Britain, Connecticut.

AREA: General Banking Area.

ARCHITECT: Jeter & Cook, Hartford, Connecticut.

ENGINEER: Henri Van Zelm Associates.

DESIGNER: Walter Heywood, West Hartford, Conn.

GENERAL CONTRACTOR: Frank Downes Construction Company, New Britain, Connecticut.

ELECTRICAL CONTRACTOR: Gunning Electric Company, Hartford, Connecticut.

FIXTURES: Litecontrol No. 6044RS 4-lamp recessed fixtures with Plexiglas dish.

INTENSITY: Average 75 foot-candles maintained.

LITECONTROL

Fixtures

KEEP UPKEEP DOWN

LITECONTROL CORPORATION,

36 Pleasant Street, Watertown 72, Massachusetts

DESIGNERS, ENGINEERS AND MANUFACTURERS OF FLUORESCENT LIGHTING EQUIPMENT DISTRIBUTED ONLY THROUGH ACCREDITED WHOLESALERS

To be stocked
by your G-E Distributor

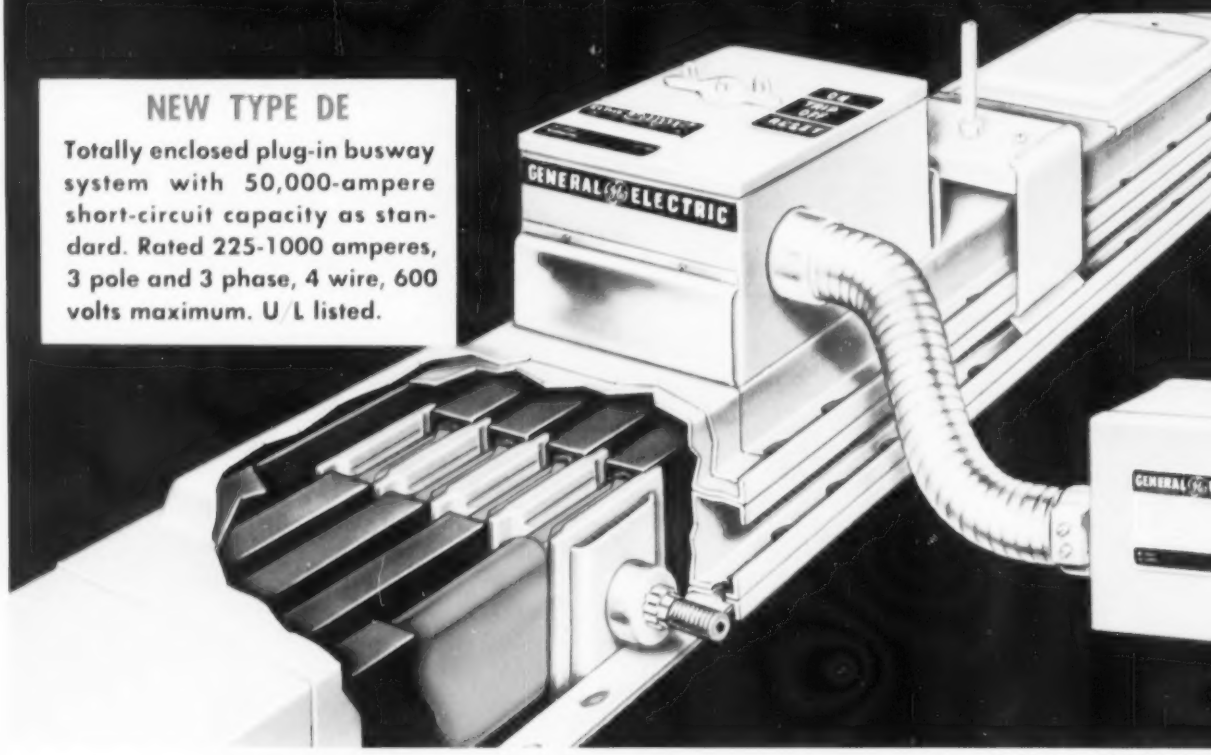
THE FIRST BUSWAY DESIGNED SPECIFICALLY AND EXCLUSIVELY FOR ALUMINUM

GENERAL ELECTRIC

2 NEW SYSTEMS—AMPERE
LIGHTEST, MOST EFFICIENT A

NEW TYPE DE

Totally enclosed plug-in busway system with 50,000-ampere short-circuit capacity as standard. Rated 225-1000 amperes, 3 pole and 3 phase, 4 wire, 600 volts maximum. U/L listed.



WHY ALUMINUM?

In a recent study among contractors, consulting engineers and users three outstanding advantages of aluminum in busway were reported over and over: lower cost, lighter weight, availability.

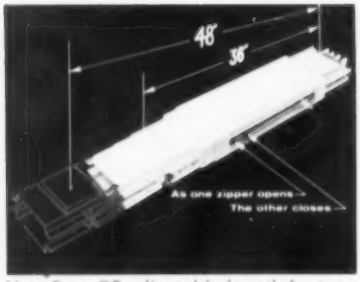
Market forecasts show that the use of aluminum will increase by 70% within three years *and by 1962 will account for two-thirds of all busway manufactured.* In the words of many engineers and contractors: "The market is logically shifting to aluminum."

G.E.'s new Type DE and DH busway offer these advantages of aluminum—plus entirely new advances in fundamental busway design. (See reverse side for full summary.)

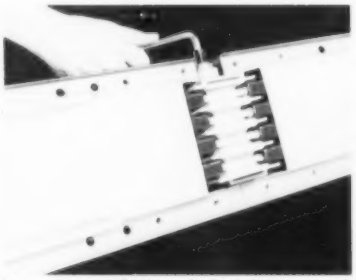
TYPE DE BUSWAY. T
sents the first *major ad*

Its principal use is a
mercial buildings—and
fered by no other busw

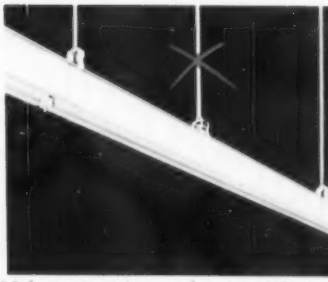
Type DE is up to 50
of comparable rating.
10% over-all. It virtua
offers the lowest voltag
of the major features
portant in busway des
busway that has every



New Type DE adjustable length features unique zipper closure for built-in safety. New telescoping length adjusts between 36 and 48 inches . . . eliminates need for exacting layouts. Tandem zipper arrangement seals off opening to live parts for greater safety. As one zipper opens ahead of sliding handle, the other closes behind it.

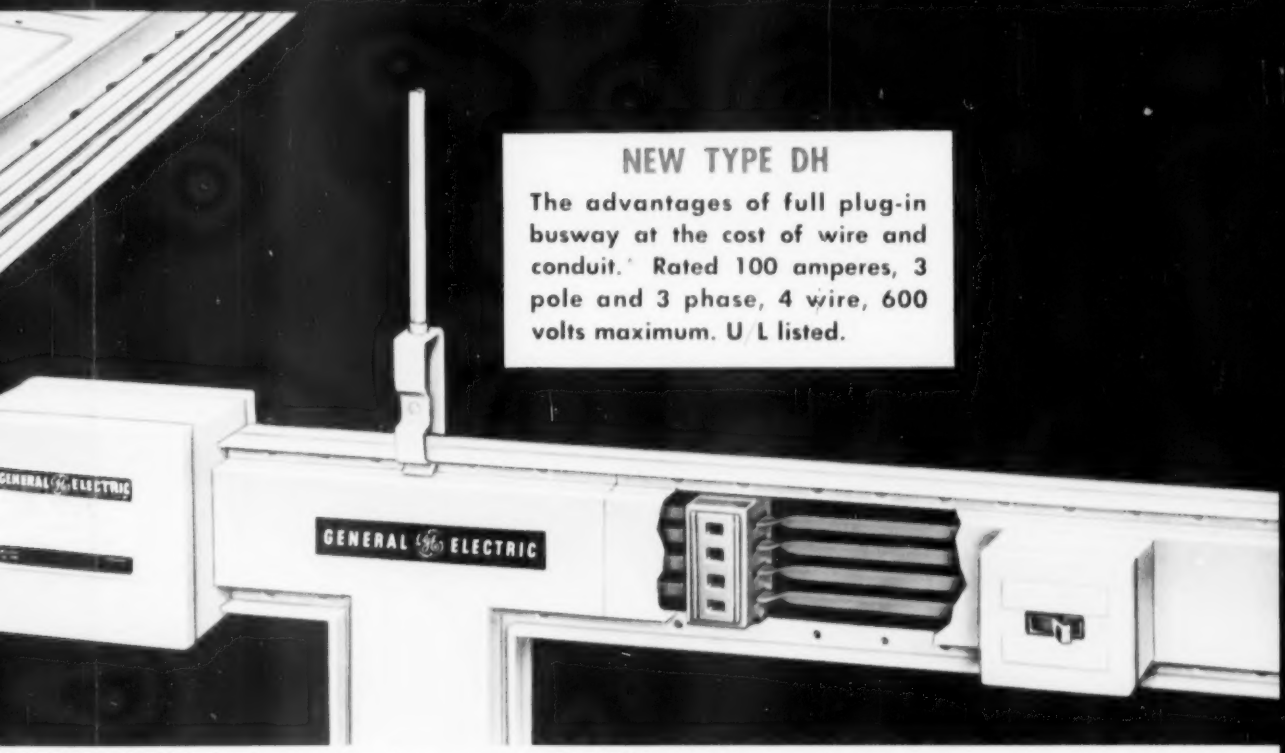


New Type DE "one-bolt joint" speeds assembly, maintains electrical contact with ton of force. Single, vise-like bolt, tightened with every-day wrench, exerts as much as a ton of force on overlapping conductors to make positive electrical contact at each joint. Twin joint cover plates provide sturdy mechanical joint connection.



10-foot mounting and snap-on hang
cut installation costs in half. Type
busway's light weight and rugged constr
tion permit hanger suspension at 10-foot
tervals (instead of usual five) in *any* p
tion under virtually *any* conditions. T
unique advantage, plus snap-on hangers,
duces installation costs as much as 50%.

E FOR AMPERE, THE SMALLEST, AND RUGGED EVER DESIGNED!


NEW TYPE DH
The advantages of full plug-in busway at the cost of wire and conduit. Rated 100 amperes, 3 pole and 3 phase, 4 wire, 600 volts maximum. U/L listed.
GENERAL ELECTRIC
GENERAL ELECTRIC

WAY. This new light-weight, small-size busway repre- *ajor advance* in plug-in busway design in 15 years. use is as a plug-in system in industrial plants and com- gs—and to these applications it brings advantages of- er busway.

up to 50% lighter and 30% smaller than other busway rating. It can save up to 50% in installation costs and lt virtually eliminates need for custom engineering and st voltage drop available. In short, it incorporates *all* 22 eatures that engineers, contractors and users say are im- way design. That's why it has been described as "the s everything."

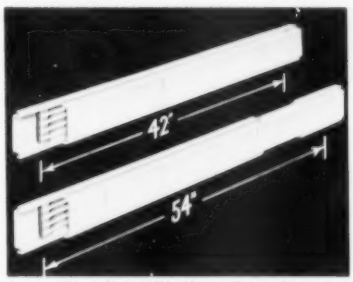
TYPE DH BUSWAY. *"With Type DH I can save 25% on the cost of a conduit and wire job when there are four or more tap-offs on the system,"* said one of the leading electrical contractors in Wilmington, Delaware, after a field test of new Type DH. Type DH is *fully competitive* with conduit and wire systems on a total installed cost basis!

Type DH busway serves as either a feeder or plug-in system. It's equally at home in the large industrial plant or the small machine shop, in the commercial skyscraper or the school laboratory—in almost any indoor place where small blocks of power are desirable.

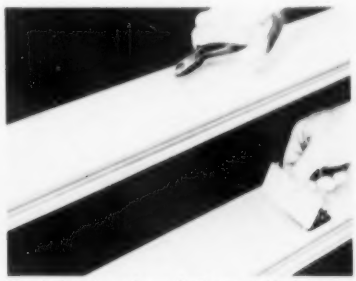
G-E Distributors stock Type DH busway, including its wide variety of fittings and accessories, to meet almost any job requirement. It thus matches wire and conduit in availability.

on hangers
. Type DE
ed construc-
t 10-foot in-
in *any* posi-
itions. This
hangers, re-
as 50%.

New G-E Type DH busway may be mounted on 10-foot centers — installs quickly, easily. Underwriters' Laboratories, Inc. lists Type DH busway for suspension on 10-foot centers if it is mounted in the edgewise position. Mechanical and electrical joint connections are made by simply tightening six captive screws.



Type DH adjustable length and variety of fittings add flexibility. Telescoping length adjusts between 42 and 54 inches. This, plus flexible fittings, eliminates need for exact measurement. Rigid fittings — elbows, tees and crosses — adapt busway to virtually any building contour. Lengths can be easily removed from run.



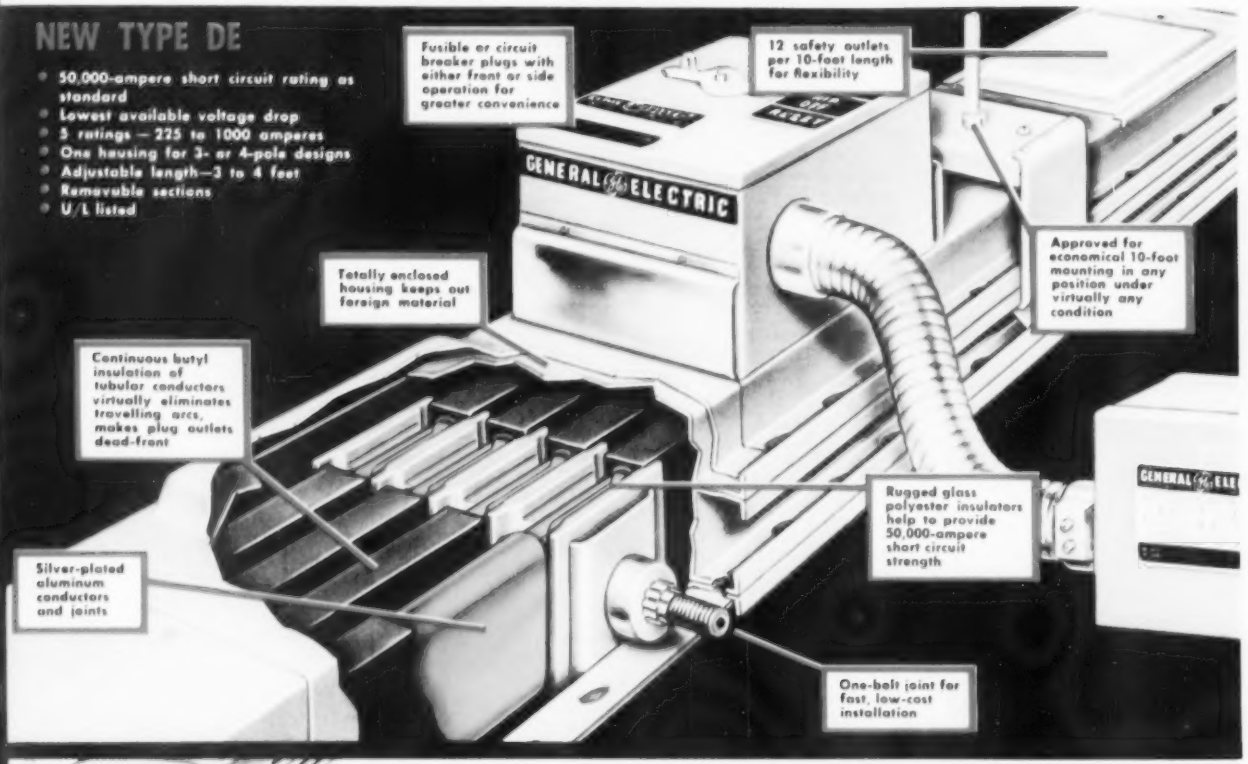
Straight lengths of Type DH busway provide up to 18 outlets each. Outlets are arranged in pairs, back-to-back on busway. Nine of 18 outlets on 10-foot length may be used at same time. Outlet covers are quickly and easily removed with pair of pliers. Even after removal of covers, plug outlets are dead front for greater safety.

NEW GENERAL ELECTRIC TYPE DE AND DH BUSWAY

The first busway designed specifically and exclusively for aluminum

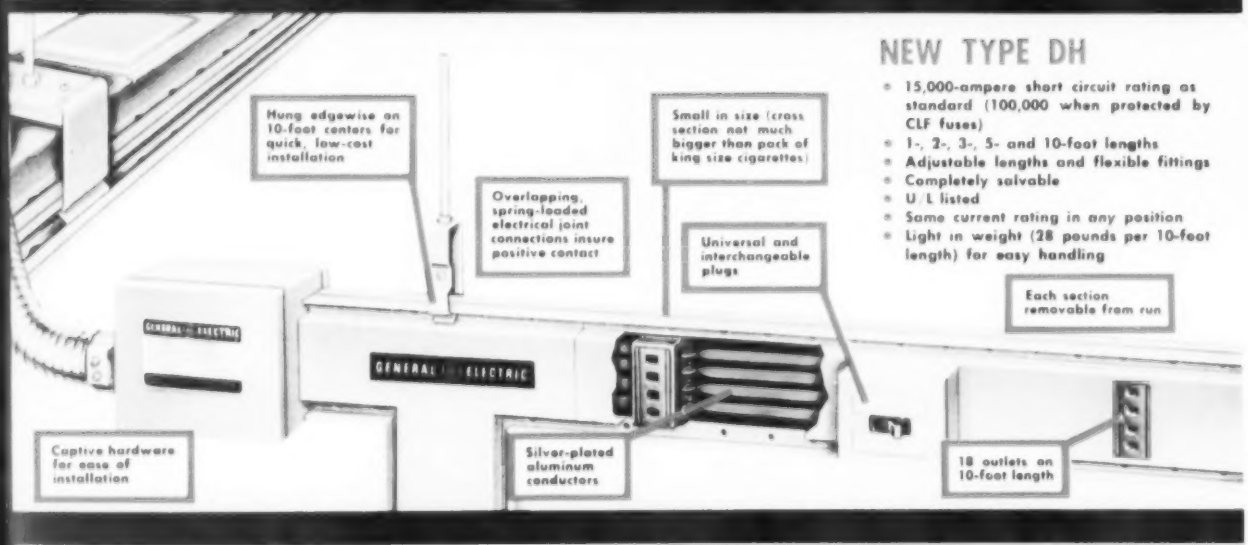
NEW TYPE DE

- 50,000-ampere short circuit rating as standard
- Lowest available voltage drop
- 5 ratings — 225 to 1000 amperes
- One housing for 3- or 4-pole designs
- Adjustable length—3 to 4 feet
- Removable sections
- U/L listed


Fusible or circuit breaker plugs with either front or side operation for greater convenience
12 safety outlets per 10-foot length for flexibility
GENERAL ELECTRIC
Totally enclosed housing keeps out foreign material
Approved for economical 10-foot mounting in any position under virtually any condition
Continuous butyl insulation of tubular conductors virtually eliminates travelling arcs, makes plug outlets dead-front
Rugged glass polyester insulators help to provide 50,000-ampere short circuit strength
Silver-plated aluminum conductors and joints
One-bolt joint for fast, low-cost installation

NEW TYPE DH

- 15,000-ampere short circuit rating as standard (100,000 when protected by CLF fuses)
- 1-, 2-, 3-, 5- and 10-foot lengths
- Adjustable lengths and flexible fittings
- Completely salvable
- U/L listed
- Same current rating in any position
- Light in weight (28 pounds per 10-foot length) for easy handling


Hung edgewise on 10-foot centers for quick, low-cost installation
Small in size (cross section not much bigger than pack of king size cigarettes)
Overlapping, spring-loaded electrical joint connections insure positive contact
Universal and interchangeable plugs
Each section removable from run
GENERAL ELECTRIC
Captive hardware for ease of installation
Silver-plated aluminum conductors
18 outlets on 10-foot length

Type DE busway is described in Bulletin GEA-6173 and Type DH busway in Bulletin GEA-6172. For copies of these bulletins, see your nearest General Electric distributor or sales representative. Or write to **Distribution Assemblies Department, General Electric, Plainville, Conn.**

Progress Is Our Most Important Product

GENERAL ELECTRIC

When choosing a premium power cable . . .

How much choice do you really have?

Cable may *look* alike—but you can find many differences in jackets and insulating compounds. And you want only the *best* cable for your operating conditions.

That's why it's important to choose your cable from a manufacturer who offers you a real choice of modern cable materials.

Full choice of insulating compounds

Only three major companies give you a choice of *either* oil-base or butyl-base insulation. Rome Cable is one of these three and offers a choice of Rozone A (butyl-base) and Rozone (oil-base) insulations.

And, in addition, Rome can offer you a *polyethylene* insulation for high voltages.

You can match your operating needs more closely with cable insulation that puts the emphasis on what you want most—resistance to heat, moisture, ozone cutting, or any combination of properties. You can be sure of this choice when the cable is made by Rome Cable.

Getting the right jacket

In modern jacket materials, too, the same kind of freedom works to your advantage. You get a choice, with Rome Cable, of Roseal (special flame-retardant polyethylene); Roprene (a Rome-developed neoprene compound for use with rubber insulations); Rolene (polyethylene); and several other high-quality jacketing compounds. Each has its own advantages, depending on your requirements.

Bring your cable problems to Rome

When you discuss your premium cable requirements with your Rome Cable representative, you can count on his recommending the *right* cable for you. No matter what type of cable you choose, take advantage of Rome's ability to offer you a *real* choice.

For more information on the choice you get with Rome's power cable, contact him now—or write to Department 713, Rome Cable Corporation, Rome, New York.

ROME CABLE

CORPORATION

"Heads-up" wiring in Texas...

...as Crain Electric installs Rome's tough power cable at Amarillo's new Olsen Park school

For the long cable pull on this job—from transformer vault to the service connection on the pole—Crain Electric Company needed a tough, abrasion-resistant cable. That's one reason they installed Rome's Rozone-Roseal power cable.

Here are the other reasons why this rugged cable is ideal for almost every type of high-voltage installation—either underground or overhead:

Special polyethylene protection. Roseal is a special flame-retardant polyethylene developed by Rome Cable. It provides excellent resistance to abrasion, moisture, weathering, oils, and most chemicals; and it is considerably easier to pull than other cables. You can install Roseal-jacketed cable underground or overhead, in climates as distinctly different as Amarillo's and Duluth's, and still enjoy the benefits of long cable life.

Water and ozone-resistant insulation. A special oil-base insulation—Rozone—assures protection against ozone cutting and moisture. High dielectric and impulse strength makes it an outstanding choice for your high-voltage installations. And its unusual resistance to moisture permits you to bury this cable safely in areas where it must remain immersed in water for long periods of time.

Specify Rome's Rozone-Roseal for your next job. Contact your nearest Rome Cable representative for more information—or write to Department 717, Rome Cable Corporation, Rome, New York.

ROME CABLE
CORPORATION

UNDERGROUND OR OVERHEAD. Power cable leaves reels for underground installation to pole. It's also ideal for overhead use.

EASY TO PULL. This Crain Electric Company workman guides Rome's high-voltage power cable into conduit at the start of a 250-foot pull from Amarillo's new Olsen Park school.

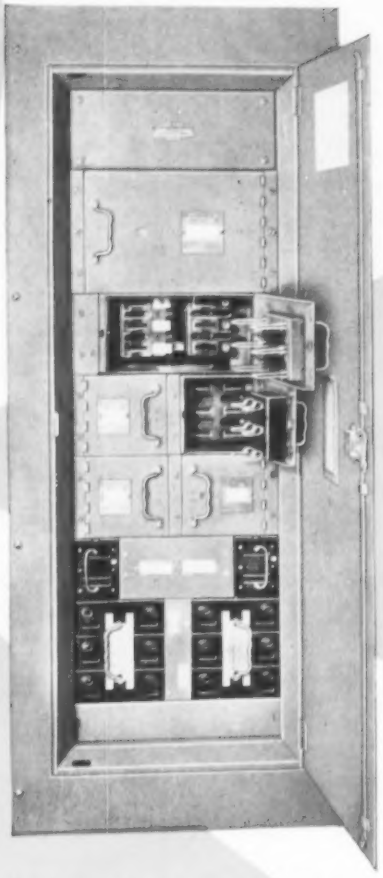
LONG CABLE LIFE. Crain's crew prepares to make the overhead service connection. Because this tough power cable is highly resistant to abrasion, moisture, and weathering, long cable life is assured.

a quick solution to your feeder distribution problems

Frank Adam

panel base assembly type

feeder distribution panelboards



The next time you are confronted with a feeder distribution problem, install Frank Adam plug-in type Feeder Distribution panel boards.

You will be amazed to find how easy and quickly it is to install these new and better panelboards and how smoothly and efficiently they will solve your power distribution problem.

Frank Adam plug-in type panelboards are of the panel base assembly type which means that all components—mounting back with main bus bar and lugs, box and front and required switching units—are stocked on dealer's shelves for quick and easy installation on the job.

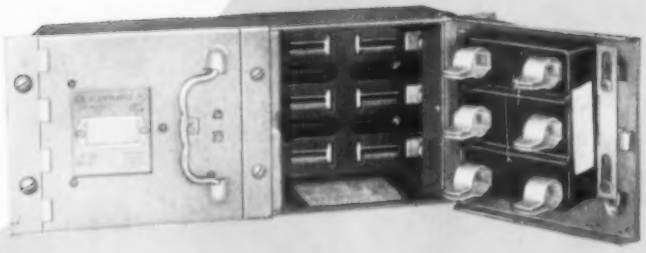
There's no installation delays, no interference with plant operations, no waiting for missing parts or factory assemblies. Just order from dealer's stock, install and go. It's as simple as that.

Two dependable Frank Adam switch units—the PFS (Pulfuzswitch) and the KSF (Klampswitchfuz)—make these panelboards the finest in safety and efficiency. Both switch units are of the operating type, horsepower-rated. Both combine switch and fuse into one unit so that the current is "off" when the fuse carriers are removed and the door opened.

Boxes too are standardized as to width, depth, and height to fit almost any electrical requirement and for easy stocking on dealer's shelves. Standard knockouts in ends are provided in the 19″ wide boxes and removable ends to permit drilling conduit openings on the job are provided in the 24″ boxes. Generous wiring space is another feature.

Like other Frank Adam products these panelboards are expandable. They not only provide the branch circuits needed for today, but they are so designed that future circuits and changes in capacities are a simple matter of plugging in new circuits.

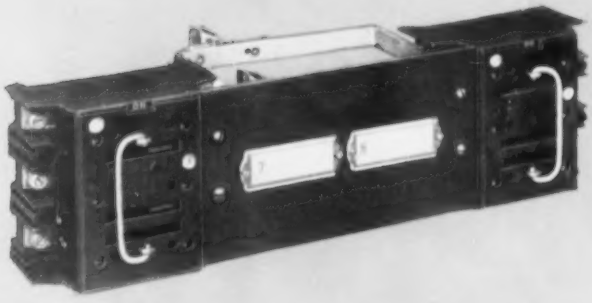
Specify these panelboards for all your future feeder distribution needs. You'll find that they are tops in performance, that they require less maintenance and that they will save you time, labor and money.



(FA) KLAMPSWITCHFUZ
hinged type

Combines both disconnect switch and fuse protection into one unit, assuring years of trouble-free service. Heavily electro-silver plated copper contacts clamp fuses under pressure for low resistance continuous duty.

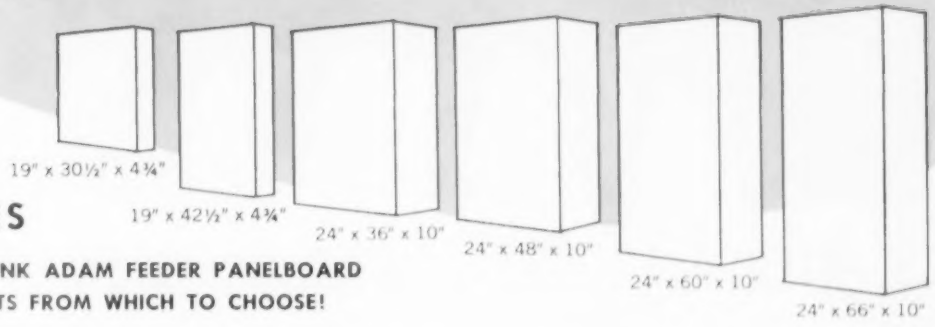
Access to fuses can be had only when door is opened. Doors can be closed in "on" or "off" position. Switch ratings are 30 to 600 amps., 240 volts AC, 250 volts DC, 2, 3 and 4 poles double or single throw.



(FA) PULFUZSWITCH
pull-out type

A safety type disconnect with pressure type fuseholders. To throw switch from "on" to "off" position, pull out fuse carrier—turn 180 degrees—and reinsert into base.

For maximum efficiency all current-carrying switch and fuse contacts are heavily electro-silver plated. Capacities are 30, 60 and 100 amp., 240 volts AC or 250 volts DC, 2 and 3 poles.



6 SIZES

OF FRANK ADAM FEEDER PANELBOARD CABINETS FROM WHICH TO CHOOSE!

Frank Adam Feeder Distribution panelboards in the panel base assembly type are available in six sizes ranging from 19 x 30 x 4¾ to 24 x 66 x 10, which means that there is a panelboard for virtually every need. Ask your nearest (FA) wholesaler or jobber about them.

FRANK ADAM

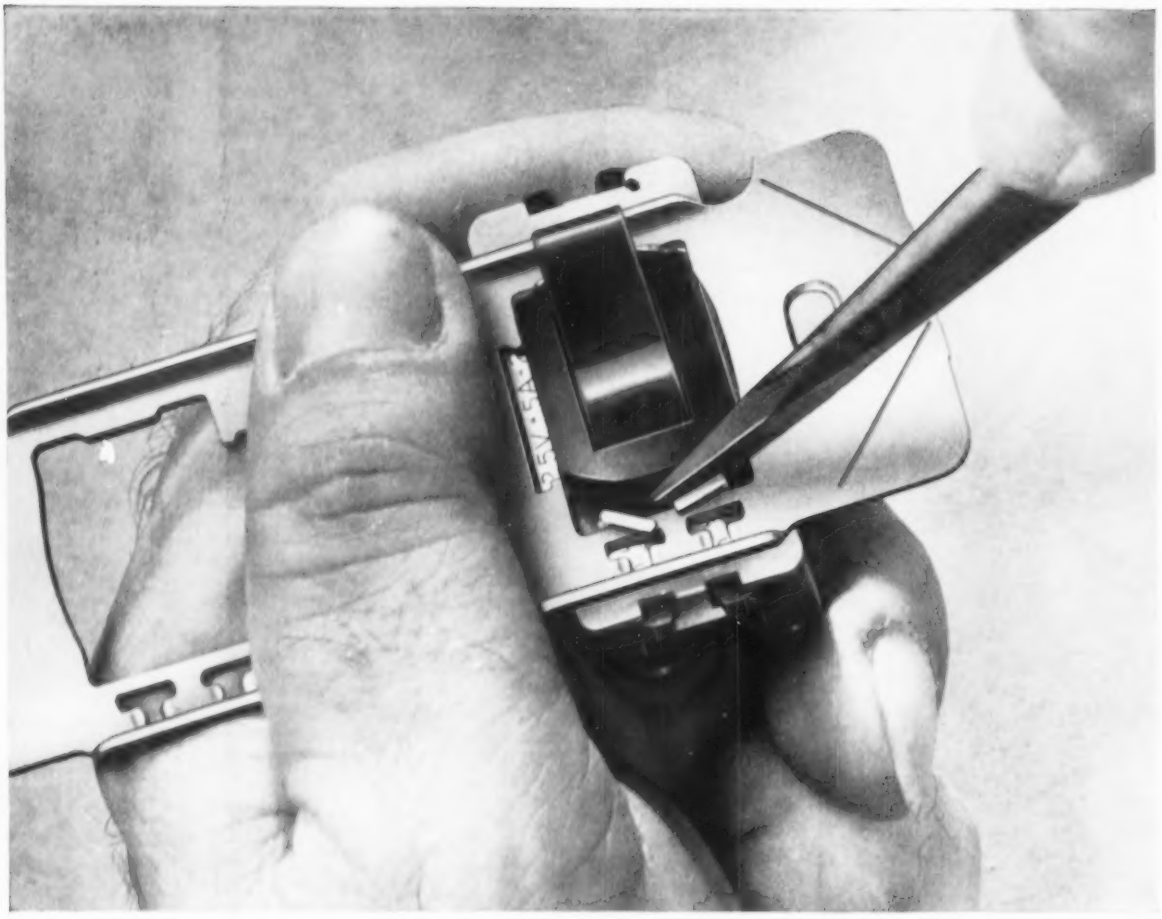
FRANK ADAM ELECTRIC COMPANY

BOX 357, MAIN P. O. • ST. LOUIS 3, MO.

makers of

busduct • panelboards • switchboards • service equipment

safety switches • load centers • Quikheter



G-E INTERCHANGEABLE LINE IS THE HANDIEST YET!

General Electric has brought out a new line of interchangeable devices that are amazingly easy to install.

Instead of bending a part of the mounting bracket to hold each device in place, you simply twist — using your regular screwdriver — a double-hook *on the device*. THE RESULT: it takes you only a few seconds to get firm mounting on any bracket. What's more, G-E interchangeable devices are always easy to change or replace . . . there's never a distorted mounting bracket to take off and discard because it's too bent to reuse.

G-E interchangeable devices also provide other handy advantages:

1. All devices have pressure-lock terminals. Dual terminals that permit looping, and extra common terminals, give you the circuit flexibility you want.
2. Switches are easy to tell apart. Tumbler switches have rounded handles . . . AC switches, squared handles.

G-E interchangeable devices are available now through your G-E distributor. Try them . . . see for yourself why they are the handiest of all! General Electric Company, Wiring Device Dept., Providence 7, Rhode Island.

DEVICES AVAILABLE IN G-E INTERCHANGEABLE LINE

Number	Description	Rating
GE7611	Tumbler switch, single pole	10A,-125V; 5A,-250V
GE7621	Same as GE7611, only T-rated	
GE7613	Tumbler switch, three-way	10A,-125V; 5A,-250V
GE7623	Same as GE7613, only T-rated	
GE7631	AC switch, single pole	15A, 120-277V AC
GE7633	AC switch, 3-way	15A, 120-277V AC
GE7630	Outlet	15A,-125V
GE7635	Pilot Light	1/25W—125V

ALL DEVICES AVAILABLE IN BROWN AND IN IVORY.

ALL DEVICES LISTED BY UNDERWRITERS' LABORATORIES, INC.

Progress Is Our Most Important Product

GENERAL ELECTRIC

Specify PHELPS DODGE HABIRITE-INSULATED ARMO-LOK CABLE

Phelps Dodge Armo-Lok cable with Habirite (butyl rubber) insulation—a companion to Phelps Dodge Varnished Cambric insulated interlocked armor cable—is more than "just another interlocked armor cable."

Habirite—developed through years of Phelps Dodge experience in the design and manufacture of high voltage cables—is a specially engineered butyl rubber compound. It far surpasses any other type of rubber insulation for dependable service.

Habirite offers these distinct advantages over other rubber insulations:

- Far greater resistance to heat and oxidation with consequent higher temperature rating and lower conductor size and cable cost.
- Far greater resistance to ozone found around high voltage equipment.
- Far greater mechanical toughness.
- Better electrical properties affording a greater safety factor in operation.
- Highest uniformity due to controlled uniformity of raw material.

★ ★ ★

See your Phelps Dodge distributor for information on a complete Armo-Lok system. For catalogue and specification data on Habirite or Varnished Cambric insulated Armo-Lok cable, write: Dept. E12, Phelps Dodge Copper Products Corporation, 300 Park Avenue, New York 22, N. Y.

PHELPS DODGE COPPER PRODUCTS CORPORATION

SALES OFFICES: Atlanta, Birmingham, Ala., Boston, Buffalo, Charlotte, Chicago, Cincinnati, Cleveland, Dallas, Detroit, Fort Wayne, Greensboro, N. C., Houston, Jacksonville, Kansas City, Mo., Los Angeles, Milwaukee, Minneapolis, New Orleans, New York, Philadelphia, Pittsburgh, Portland, Ore., Richmond, Rochester, N. Y., San Francisco, St. Louis, Seattle, Washington, D. C.

SORGEL — the Quietest dry-type transformers at standard prices

WE GUARANTEE that the sound levels of ALL Sorgel dry-type transformers are well below the established standards in ALL ratings up to 3000 Kva, and all voltages up to 15,000 volts. This has been an outstanding feature in Sorgel transformers for many years; in fact, we are the **originators** of low sound level dry-type transformers.

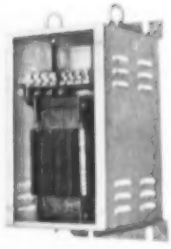
HIGHEST ENDORSEMENT. Sorgel Sound-Rated transformers have earned the highest endorsement of leading engineers and discriminating users.

OUR MODERN TESTING FACILITIES enable us to prove the low sound level, efficiency, temperature rise, and performance of Sorgel transformers, before installation.

INSTALLATION SAVINGS. SORGEL dry-type transformers are so quiet that they can be installed in any convenient place inside of buildings, close to load centers. This results in shorter feeders, better voltage regulation, more efficient distribution, and lower wiring cost.

Substation Transformers

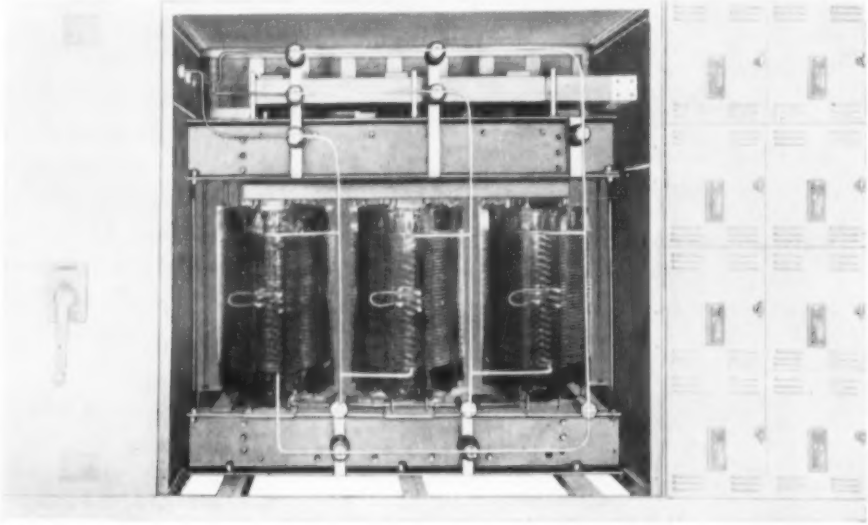
The same quiet Sorgel transformers, in ALL ratings up to 3000 Kva and up to 15,000 volts, are also incorporated in substations.
Procurable with any type or make of switchgear, or from any substation manufacturer.



20 to 75 KVA single phase. Wall mounting. Connection compartment panel removed.

Sales engineers in principal cities.

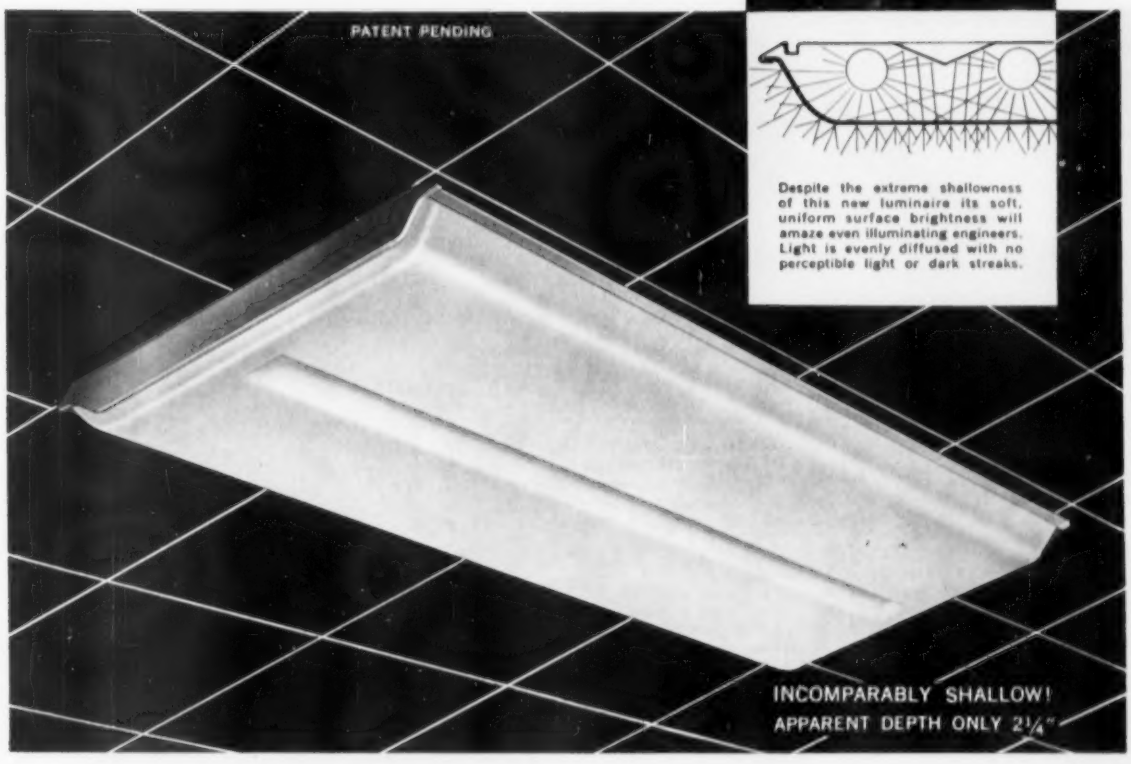
Consult the classified section of your telephone directory or communicate with our factory.



1000 Kva 13,200 volt Sorgel dry-type transformer in a substation—Compartment panel removed

SORGEL ELECTRIC CO., 836 West National Ave., Milwaukee 4, Wisconsin

IT'S SURFACE MOUNTED—BUT LOOKS RECESSED!



Despite the extreme shallowness of this new luminaire its soft, uniform surface brightness will amaze even illuminating engineers. Light is evenly diffused with no perceptible light or dark streaks.

The Fixture Setting Amazing New Latitudes in Lighting

THE

SHALLORAMA®

- 2- and 4-lamp units for widest range of applications; banks, institutional spaces, general or private offices, etc. Ideal for re-lighting.
- No latches, no hinges, no visible hardware. Installs lightning-fast.
- Diffuser opens on continuous hook-up supports by hand from either side.
- Fully enclosed by attractively contoured, micro-embossed, matte white Plexiglas, requiring minimum maintenance.

Sent for Bulletin 763-A yet?

SUNBEAM visionaire

SUNBEAM LIGHTING COMPANY, 777 EAST FOURTEENTH PLACE, LOS ANGELES 21, CALIFORNIA
SUNBEAM LIGHTING CO., INC., 3840 GEORGIA STREET, GARY, INDIANA

SPECIFY QUALITY . .

insist on *Levolier*® switches

Only McGILL makes *Levolier*® switches

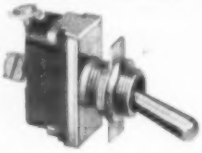
— and only Levolier switches give you the degree of quality that has earned them the reputation of being the most dependable switches ever built. Material selected for extra quality includes heavy special alloy copper or silver for contacts and all switches are pre-lubricated with highly refined plastic petroleum. Completed switches are 100% factory tested and eliminate costly replacement.

Levolier switches are designed for fast, economical installation with self-insulating molded phenolic cases. .75 to 20 amps. All are Underwriters Laboratories Inspected.

No. 71 single-pole single circuit, universal pull lever switch . . . the thinnest 6 amp. "T" 125 volt—3 amp. 250 volt switch of its kind on the market today—only 15/32" thick. Also with push button.

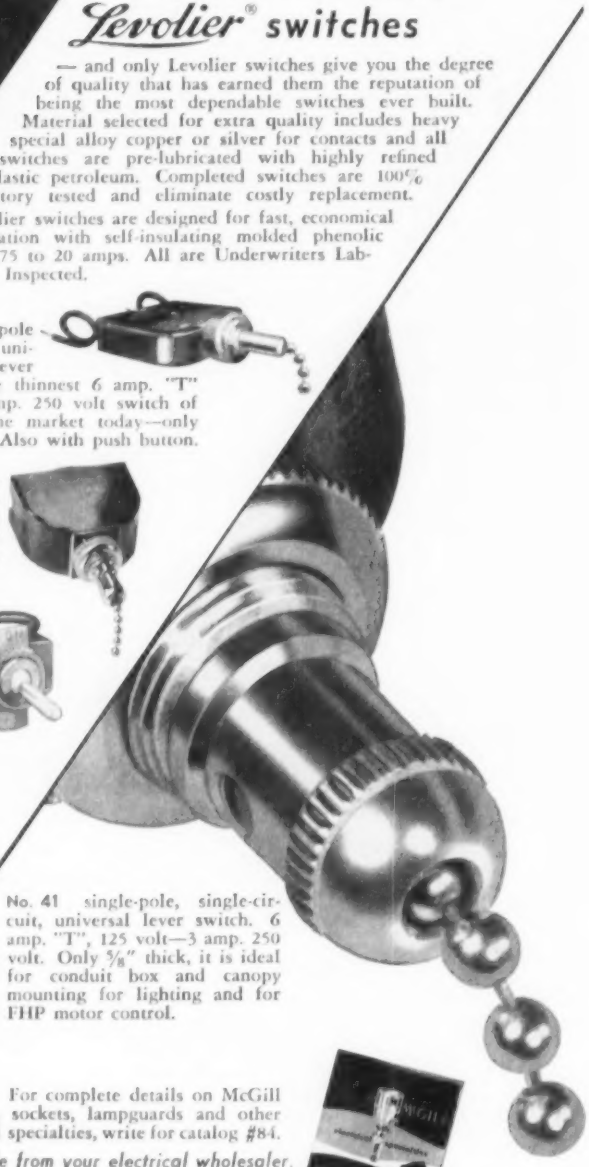
No. 1010 single-pole, single circuit lever switch for high-watt lamps and fluorescent banks. Universal pull lever control. 10 amp. 125 volt.

No. 25 toggle switch carries a 6 amp. "T", 125 volt, 3 amp., 250 volt rating with a S.P.S.T. double-break mechanism. 1/3 H.P. A.C. 120-240 volt. Ideal for panel board, F.H.P. motors, appliances, power tools, etc. Also with push button control.



No. 90 ¾ H.P. capacity, 15 amp. 125 volt, 10 amp. 250 volt toggle switch with a single-pole, single-throw mechanism. Designed for AC operation. Also available in two circuit with center off and no off.

No. 29 single-circuit, .75 amp., 125 volt momentary contact switch. Excellent for automatic control of lights as in door openings and closings. Also 4 amp. Available 15 amp., for limit and safety control of industrial machinery operations.



No. 41 single-pole, single-circuit, universal lever switch. 6 amp. "T", 125 volt—3 amp. 250 volt. Only ⅝" thick, it is ideal for conduit box and canopy mounting for lighting and for FHP motor control.

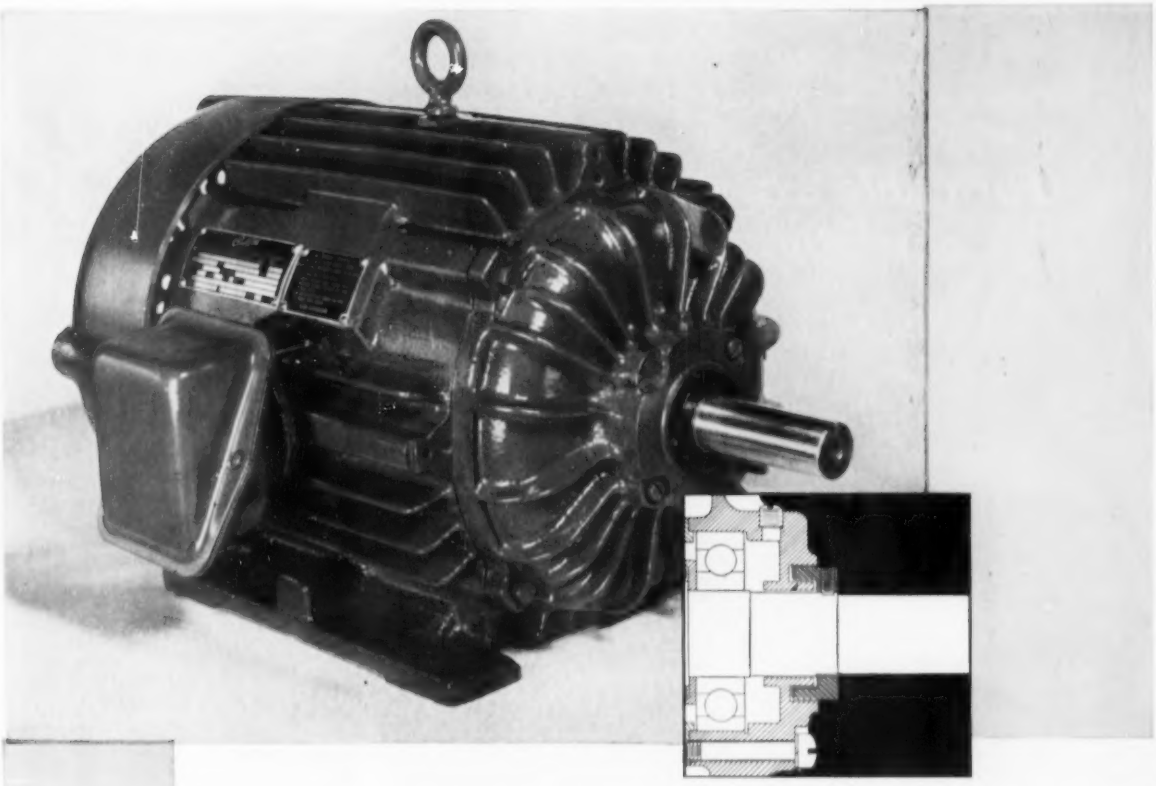
FREE! For complete details on McGill switches, sockets, lampguards and other electrical specialties, write for catalog #84.

Available from your electrical wholesaler.

McGILL®
ELECTRICAL SPECIALTIES

are always a little better and ***ALL*** *are Underwriters Laboratories Inspected*

McGILL MANUFACTURING COMPANY, INC. **450 N. Campbell St., Valparaiso, Indiana**



Securely sealed for low maintenance—

TOTALLY ENCLOSED FAN COOLED MOTORS

Century

When motor maintenance goes down, production goes up. Century TEFC Motor *protects itself* from dust, grit, chemical fumes, moisture. Shaft openings at each end are labyrinth-sealed, and there is a precision clearance between metal seal and bearing bracket.

Outside, a hose or whisk broom quickly cleans it. External fan forces jets of cooling air across the frame. Inside, vital motor parts are completely sealed off from injurious atmosphere. Factory lubrication of bearings is adequate for several years' service under normal conditions; however, whenever required bearings may be relubricated through grease plugs.

For full facts on your specific application, call the Century District Office or Authorized Distributor nearest you.

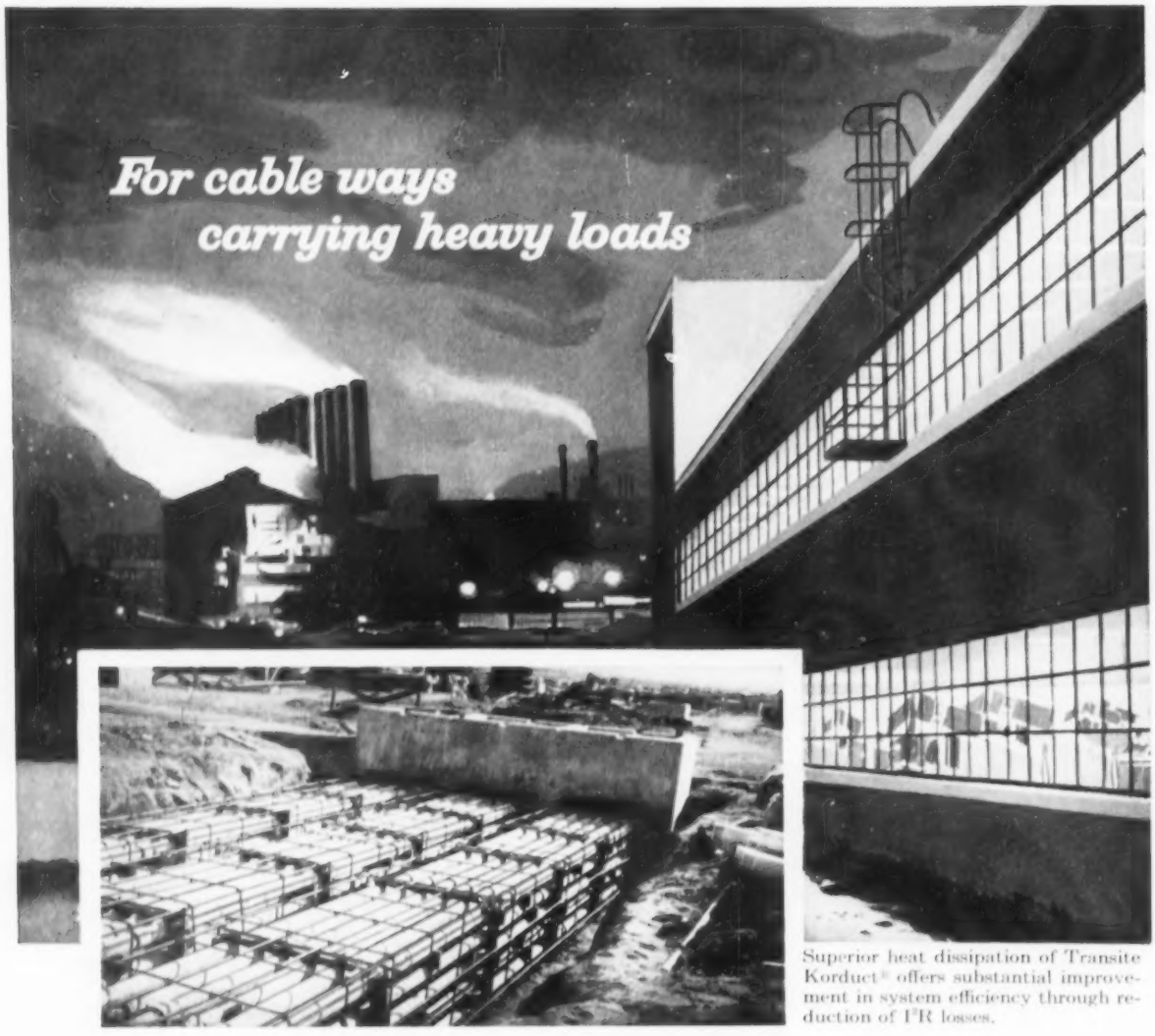
CENTURY . . . building TEFC Motors for 25 years

CE-66R

Performance-Rated®
MOTORS
1/20 to 400 H.P.

CENTURY ELECTRIC COMPANY

1806 Pine Street • St. Louis 3, Missouri • *Offices and Stock Points in Principal Cities*



Superior heat dissipation of Transite Korduct® offers substantial improvement in system efficiency through reduction of I^2R losses.

J-M Transite® Ducts mean increased capacity—longer cable life—maximum return on investment

FINDINGS OF TESTS made at Johns-Manville Research Center and approved for presentation by AIEE Insulated Conductor Committee, show that J-M Transite Ducts dissipate heat of cables faster. The result is cooler cables under a given load . . . lower I^2R losses . . . longer insulation life from lower operating temperatures.

Transite Ducts offer many other advantages, too. Made of asbestos-cement, they are incombustible, resistant to corrosion, unaffected by electrolysis. Transite Ducts resist damage when arcing occurs. These durable, lightweight ducts provide complete and permanent cable protection, together with savings on installation and maintenance.

For complete details of tests and the many advantages of Transite Ducts, write for Brochure EL-29A, and J-M Cooler Cables story. Johns-Manville, Box 14, N. Y. 16, N. Y. In Canada: Port Credit, Ont.

JM PRODUCTS

Johns-Manville TRANSITE Asbestos-Cement DUCTS

J-M CONDUIT for direct buried banks and exposed runs—J-M KORDUCTS for concrete banks

Simplex

ANNOUNCES the C-L-X* Sheath

...an entirely new closed system that gives incomparable benefits in all types of cable installations

Simplex C-L-X is a Continuous Lightweight eXterior metallic sheath that is impervious to gases, chemicals and water. Its unique construction gives it a combination of properties that is unmatched by any cable system now manufactured in the United States.

C-L-X provides a completely sealed conduit — with "built-in" cable. C-L-X combines all the advantages of lead sheathed and interlocked armored cables. In addition, it has its own intrinsic qualities of great strength with extremely light weight. It is suitable for installation in trays or by clamps. C-L-X can be used aerially or buried directly in the ground. Its pliability permits ease of installation.

For more than a decade, this type of cable protection has given exceptional service in European installations. *Now, Simplex engineering has adapted C-L-X so that its scope of industrial applications is practically unlimited for modern American installations.* It is unequalled in situations where impermeability and durability are important.

Like all Simplex products, C-L-X is engineered for lasting quality and, therefore, *dependability*. Write for specific product data.

*(Continuous Lightweight eXterior, pronounced "Sealex")

LIVE BETTER ELECTRICALLY

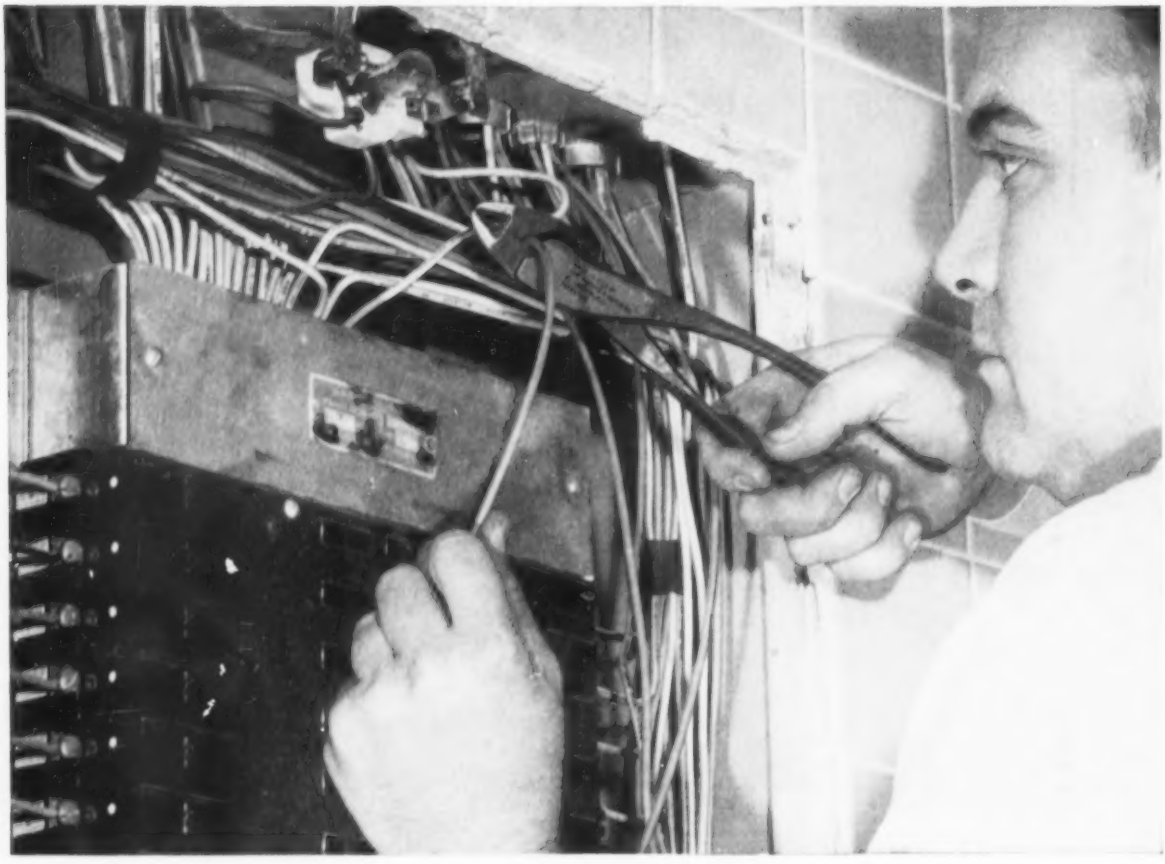
Simplex WIRE & CABLE COMPANY

79 SIDNEY STREET, CAMBRIDGE 39, MASS.

"the American manufacturers of transoceanic telephone cables"

News about

B.F.Goodrich Chemical *raw materials*



For a lifetime of adequate wiring . . . ***insulation of Geon***

BUILDING wire insulated with Geon polyvinyl materials is playing a prominent role in today's adequate wiring movement for homes and buildings. And for good reason.

These materials have exceptional properties that give TW building wire many desirable features: smaller overall wire diameters are possible because of improved insulating ability; permanent fire resistance; resistance to acids, oils, alkalies, dampness, fungi and voltage breakdowns. Since Geon polyvinyl materials have exceptional aging characteristics, insulation maintains strength and flexibility.

Owners like the safety and dependable service these "Geon-insulated" wires provide through the years. Contractors prefer them for their good flex, clean stripping qualities, toughness, abrasion resistance and the ease with which they pull through studs, joists and conduits.

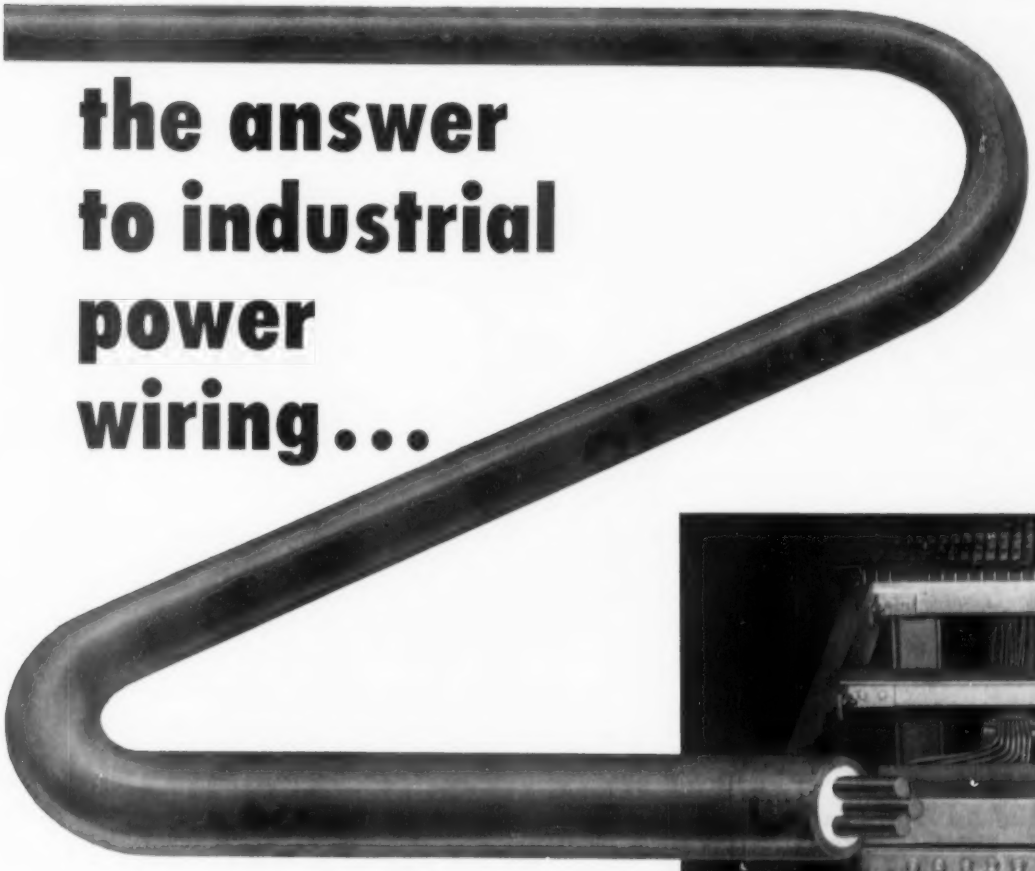
For information write Dept. GF-6, B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

B. F. Goodrich Chemical Company
a division of The B. F. Goodrich Company

B.F.Goodrich GEON polyvinyl materials • HYCAR American rubber and latex • GOOD-RITE chemicals and plasticizers • HARMON colors

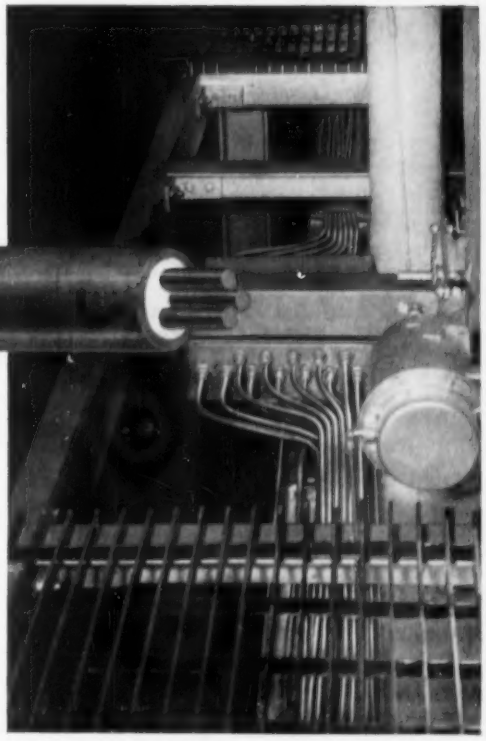
SAFETY M.I. CABLE

the answer to industrial power wiring...



- SPACE SAVING
- Time saving
- Permanent
- INSTALLED EASILY
- Fast power wiring to cut down-time

More and more General Cable's Safety M I 600 Volt Wiring System is being used because it can take the abuse of industrial application, giving trouble-free operation and unexcelled performance under the most severe conditions. Particularly adaptable in hot and wet locations. Available in 1, 2, 3, 4 and 7 conductor for power and control circuits.



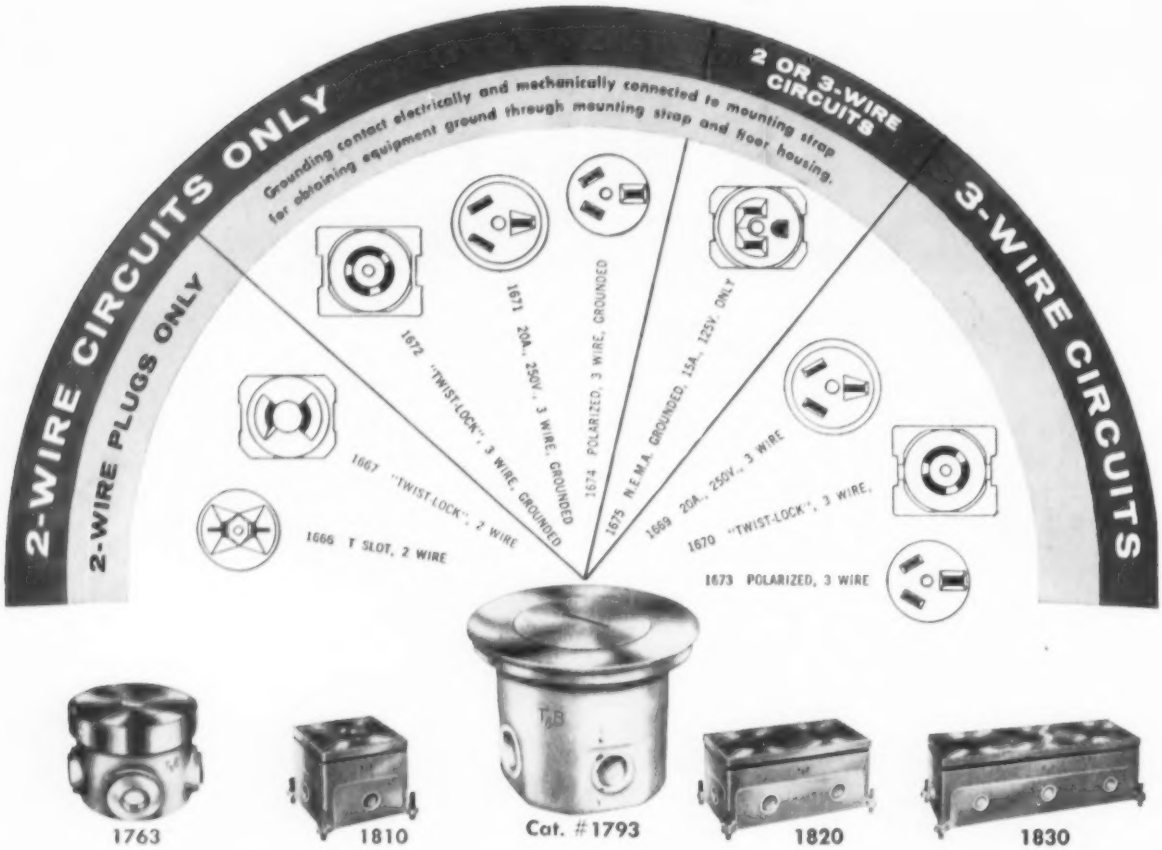
MI terminating in main Japan Oven control center switchboard at Poinsett Lumber and Manufacturing Company, Anderson, S.C.

Ask for a Demonstration To-Day!

GENERAL CABLE CORPORATION, 420 Lexington Avenue, New York 17, N. Y.

Offices and Distributing Centers Coast-to-Coast

for quality and service...specify **GENERAL CABLE**


2-WIRE CIRCUITS ONLY
2-WIRE PLUGS ONLY
Grounding contact electrically and mechanically connected to mounting strap for obtaining equipment ground through mounting strap and floor housing.
2 OR 3-WIRE CIRCUITS
3-WIRE CIRCUITS
1667 "TWIST-LOCK", 2 WIRE
1666 T SLOT, 2 WIRE
1672 "TWIST-LOCK", 3 WIRE, GROUNDED
1671 20A., 250V., 3 WIRE, GROUNDED
1674 POLARIZED, 3 WIRE, GROUNDED
1675 N.E.M.A. GROUNDED, 15A., 125V. ONLY
1669 20A., 250V., 3 WIRE
1670 "TWIST-LOCK", 3 WIRE
1673 POLARIZED, 3 WIRE
1763
1810
Cat. #1793
1820
1830

New! T&B floor box receptacle

MATCHES YOUR CIRCUIT WIRING AND THE PLUG ON YOUR EQUIPMENT

Here's a convenient money saver from T&B . . . designed to make the use of many types of receptacles easier and more readily available. T&B receptacles (there's one for every need) fit all T&B floor boxes . . . and they can be changed in a matter of minutes should you later install equipment which requires a change in receptacles.

For full information on T&B floor boxes and receptacles, contact your T&B distributor today – he will show you how to save money on installed costs, save time, and safety-ize your job with T&B floor box receptacle combinations.

LOOK FOR THE SIGN –

IT'S THE MARK OF AN AUTHORIZED **T & B** DISTRIBUTOR

The complete line of T & B fittings for conductors and raceways is sold only by recognized electrical wholesalers. It's our way of assuring you the service and savings of a friendly local source. Call him for all your electrical needs. T-510

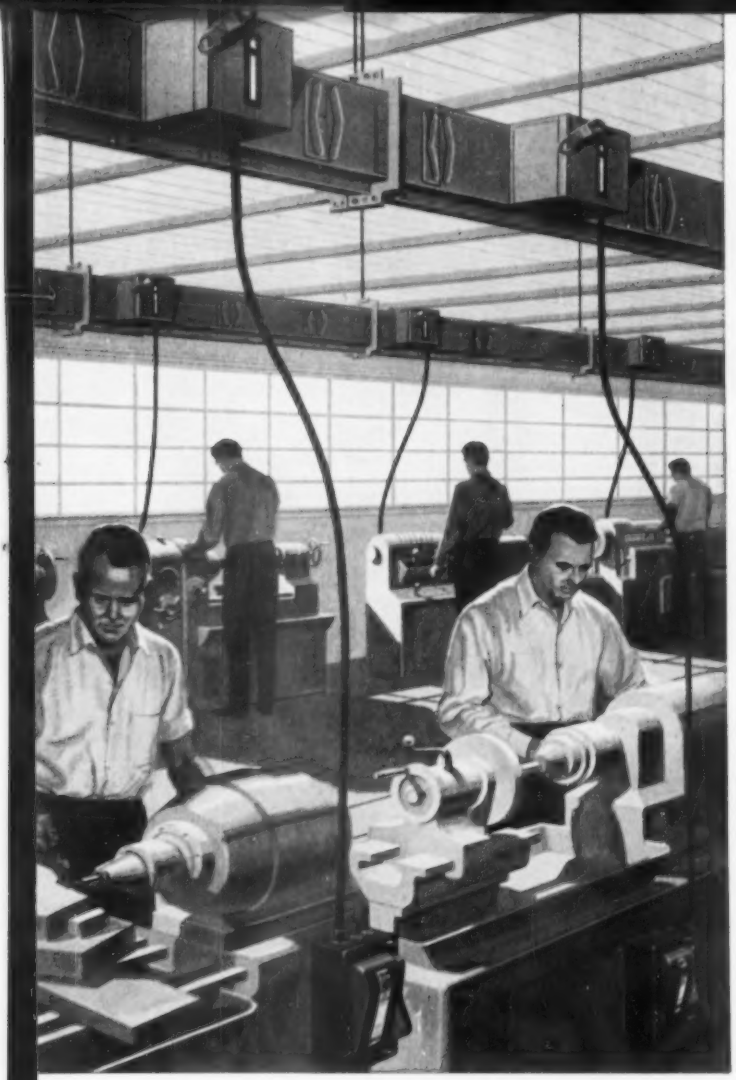
THE THOMAS & BETTS CO.

INCORPORATED

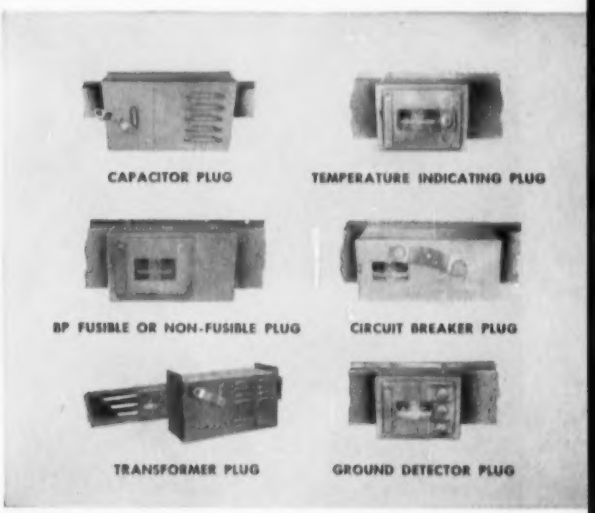
34 Butler Street • Elizabeth 1, New Jersey

Thomas & Betts Ltd., Montreal, P.Q., Canada

MANUFACTURERS OF FINE ELECTRICAL FITTINGS SINCE 1898



The Vacu-Break® Plug (above) taps live power, is available in 30 to 600 amps, 2 or 3 pole, 600 volts or less. Reinforced fingers on all plugs insure positive pressure contact.



All BullDog Bus Plugs mount on either side of the duct easily, quickly . . . eliminate rewiring and downtime. Types available for every purpose.

Seven rugged Bus Plugs provide flexible plug-in power

Get the most from power with BullDog Bus Plugs. Used with Plug-in Duct, the seven bus plugs range from safety-check plugs to types that tap power instantly from the duct . . . provide safe, flexible electrical distribution.

Plug-in openings are spaced every 10 inches along the duct. Handy to any machine, they reduce long costly branch-circuit runs. You simply plug in circuits where they are needed . . . connect equipment without cutting off power or interrupting production.

Learn how a co-ordinated BullDog distribution system, from bus plugs to unit substations, provides efficiency and flexibility for your clients . . . a wealth of customer satisfaction and profits for you. See your BullDog field engineer for complete details.

© BEPCO

BullDog Electric Products Company, Detroit 32, Michigan. • A Division of I-T-E Circuit Breaker Company • *Export Division:* 13 East 40th St., New York 16, New York. *In Canada:* BullDog Electric Products Company (Canada), Ltd., 80 Clayson Rd., Toronto 15, Ontario.

IF IT'S NEW . . . IF IT'S DIFFERENT . . . IF IT'S BETTER . . . IT'S

BULLDOG

ELECTRIC PRODUCTS COMPANY

A DIVISION OF I-T-E CIRCUIT BREAKER COMPANY

Do you worry about control circuit installation costs
WHEN YOU'RE PLAYING GOLF?

You shouldn't! Why not concentrate instead on breaking 90?

Many of your control circuit installation problems, including the cost problem, can be solved if you'll specify and use Rockbestos PNR 600 volt control cable — the cable that's been proven over and over again through more than 14,000,000 feet of installations.

Here's why Rockbestos PNR is your best buy in control cables:

- With it you save on conduit and fittings, cut installation costs.
- Rockbestos PNR lets you pull a 12 conductor control cable in conduit which is now carrying ordinary six or seven conductor cable.
- It's 46% smaller in area — 28% smaller in diameter than conventional control cable.
- It's flexible from 167° to −67°F.
- It's light, easy to handle, pull through conduits.

Get the complete Rockbestos PNR story — write now for detailed specifications and application data.

ROCKBESTOS PRODUCTS CORPORATION

NEW HAVEN 4, CONNECTICUT

NEW YORK, CLEVELAND, CHICAGO, PITTSBURGH, LOS ANGELES, DETROIT, ST. LOUIS, ATLANTA, DALLAS, OAKLAND, SEATTLE

ROCKBESTOS

PNR Small Diameter Control Cable

MORE THAN 14,000,000 FEET IN SERVICE

PYLE *star-line*® CONNECTORS

Assure long-lasting protection of vital connections under a wide range of extreme environmental conditions

Currently establishing itself as a performance leader in the missile systems field, Pyle-Star-Line connectors offer engineers an entirely new line of electrical connectors for universal military and industrial use.

With characteristics of construction and performance never before combined in compact, rugged, lightweight standardized connectors, they exceed NEC requirements and classes A, B, C and E of military specifications MIL C-5015C.

FEATURES

Tough, lightweight shell: Strength comparable to mild steel, yet weighs only ⅓ as much.

Anodic coating: Gives shell toughness of case-hardened steel. Takes up to 1800 volts to penetrate coating.

"Sandwich" insulation: Silicone laminate floats between two rigid discs. Silicone disc absorbs shock, lets contacts align themselves freely, rigid discs impart just the right amount of restraint. Gives all advantages of both flexible and rigid mountings.

Chamber sealing: Silicone insulation disc positively and completely prevents water, gas, moisture or dust from passing into shell.

Wide range of pin and socket configurations: Configurations from 2 to 100 poles available. Within each form size all inserts are interchangeable and reversible.

Environmental Limits of Pyle-Star-Line connectors	
Temperature	—80 F. to 225 F.
Pressure	300 PSI External, 200 PSI Internal
Chemical Resistance	Most acids, most alkalis, oil
Corrosion Resistance	Salt Spray: 300 days without failure
Dust Resistance	Exceed requirements of MIL C-5015C
Shock Resistance	50G Minimum
Vibration	Exceed 20G to Method II of Mil C-5015C
Humidity & Moisture Resistance	Exceed Class E. Spec. of Mil C-5015C
Air Leakage	Meet Class E Spec. of Mil C-5015C

Write today for complete specifications.

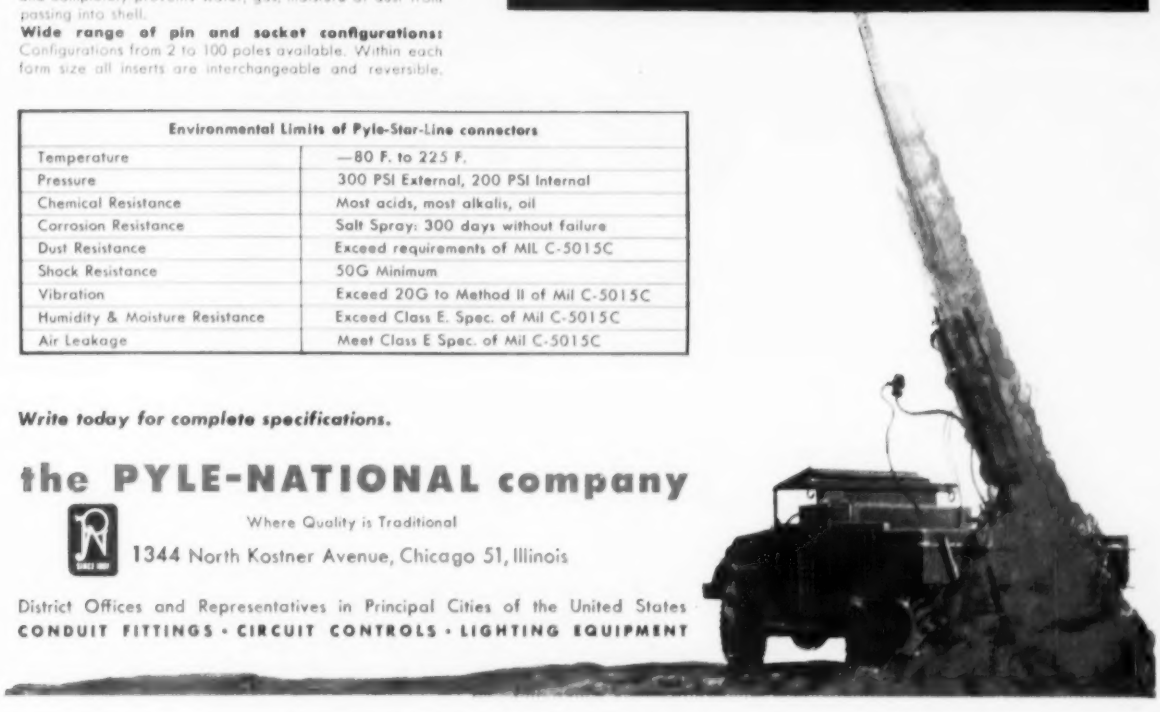
the PYLE-NATIONAL company

Where Quality is Traditional

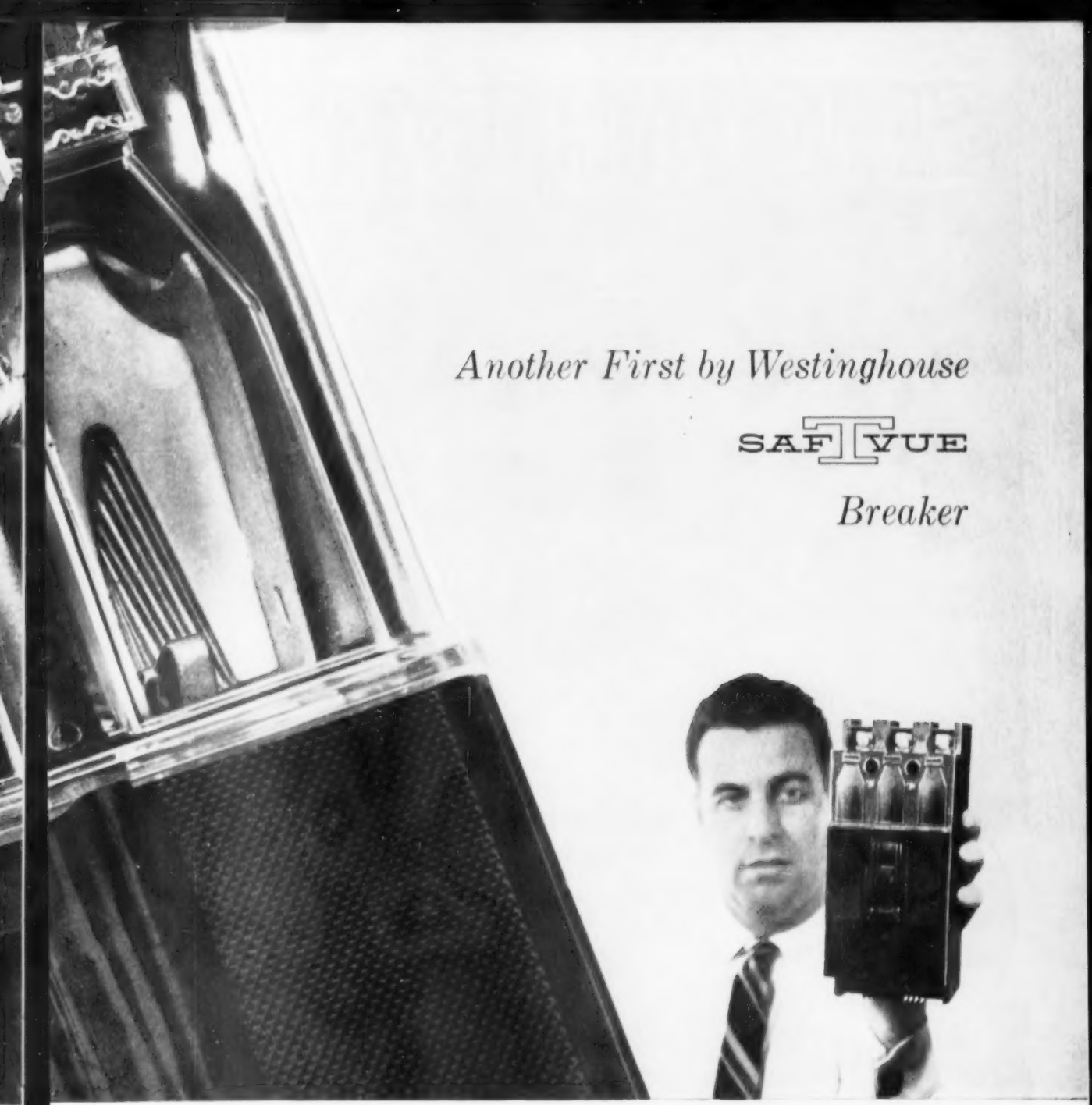
1344 North Kostner Avenue, Chicago 51, Illinois

District Offices and Representatives in Principal Cities of the United States

CONDUIT FITTINGS • CIRCUIT CONTROLS • LIGHTING EQUIPMENT



World's First Breaker with the Contacts VISIBLE



Another First by Westinghouse

SAF T VUE

Breaker

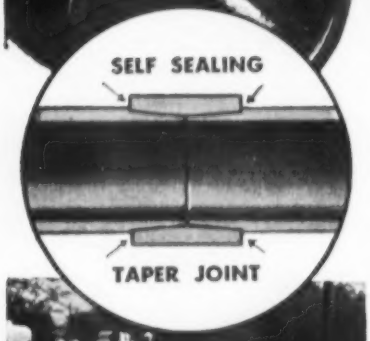
Everyone who's seen this exciting new development has said "this is the biggest thing in circuit protection since the development of breakers . . . you're sure the contacts are open (or closed) because you can see through the transparent window."

Of course they're right, and in addition, Westinghouse Saf-T-Vue Breakers have the positive action, tested accuracy, long life and special features that engineers, manufacturers, electricians and contractors have depended upon for years. Now plants whose safety codes require that contacts be visible can use the most modern form of circuit protection.

See your Westinghouse representative, or write Westinghouse Electric Corporation, Standard Control Division, Beaver, Pennsylvania. J-30286

YOU CAN BE SURE...IF IT'S Westinghouse

SMOOTH BORE!



Orangeburg Fibre Conduit Prolongs Cable Life

Protect cable sheath from abrasion and you prolong the life of underground cables, say utility engineers. Scoring of cable sheath creates "trouble spots" that shorten cable life.

That's where Orangeburg Fibre Conduit plays an important part in keeping cables healthy. Orangeburg's smooth bore, its low coefficient of friction minimize the danger of abrasion when cables are pulled in, as well as later on during cable movement. By protecting cable sheath from abrasion, Orangeburg Fibre Conduit adds years to cable life.

Orangeburg's impermeable wall and watertight joints protect cables from corrosive ground waters. Its nonmetallic material is strong, tough, resilient, long lasting.

And, remember, Orangeburg lays faster and at lower cost than other types of conduit. It is light in weight, easy to handle, easy to tool on the job. Spacers, bends, fittings, 5° bend sections and lightweight tapering tool, all combine to simplify installation.

Since 1893, records of long life have proved Orangeburg's durability and economy.

Orangeburg Fibre Conduit is distributed by Graybar Electric Company and General Electric Supply Company with branches and stocks in principal cities.

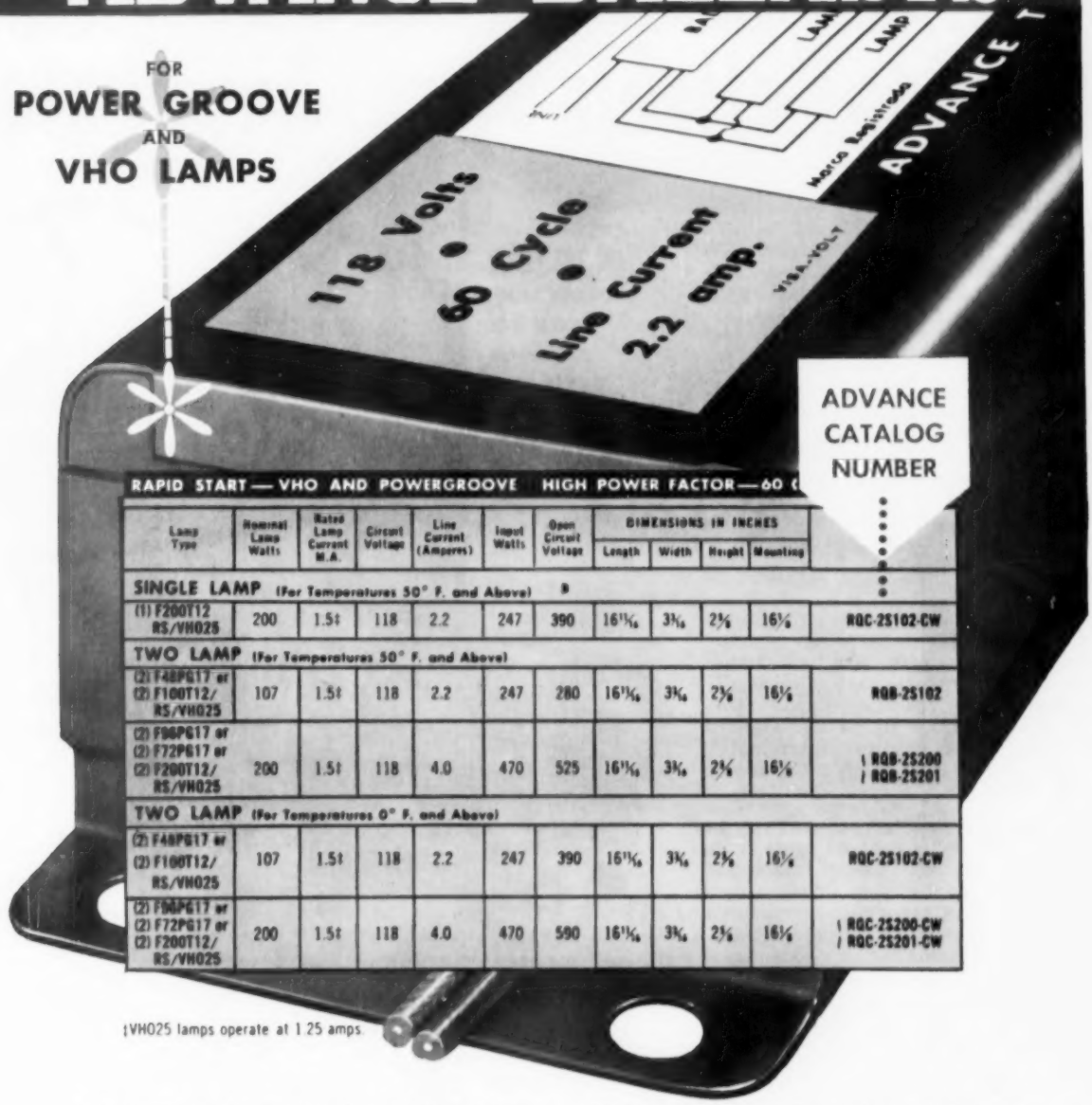
WRITE DEPT. EC-127 FOR NEW CATALOG 52.

ORANGEBURG MANUFACTURING CO., INC., Orangeburg, N. Y. West Coast Plant, Newark, Calif.

ORANGEBURG®
FIBRE CONDUIT

ADVANCE BALLASTS

FOR
POWER GROOVE
AND
VHO LAMPS



RAPID START — VHO AND POWERGROOVE HIGH POWER FACTOR — 60 C

Lamp Type	Nominal Lamp Watts	Rated Lamp Current M.A.	Circuit Voltage	Line Current (Amperes)	Input Watts	Open Circuit Voltage	DIMENSIONS IN INCHES Length	Width	Height	Mounting	
SINGLE LAMP (For Temperatures 50° F. and Above)											
(1) F200T12 RS/VHO25	200	1.5‡	118	2.2	247	390	16 11/16	3 1/16	2 1/16	16 1/16	RQC-2S102-CW
TWO LAMP (For Temperatures 50° F. and Above)											
(2) F48PG17 or (2) F100T12/ RS/VHO25	107	1.5‡	118	2.2	247	280	16 11/16	3 1/16	2 1/16	16 1/16	RQB-2S102
(2) F96PG17 or (2) F72PG17 or (2) F200T12/ RS/VHO25	200	1.5‡	118	4.0	470	525	16 11/16	3 1/16	2 1/16	16 1/16	RQB-2S200 / RQB-2S201
TWO LAMP (For Temperatures 0° F. and Above)											
(2) F48PG17 or (2) F100T12/ RS/VHO25	107	1.5‡	118	2.2	247	390	16 11/16	3 1/16	2 1/16	16 1/16	RQC-2S102-CW
(2) F96PG17 or (2) F72PG17 or (2) F200T12/ RS/VHO25	200	1.5‡	118	4.0	470	590	16 11/16	3 1/16	2 1/16	16 1/16	RQC-2S200-CW / RQC-2S201-CW

‡VHO25 lamps operate at 1.25 amps.

ADVANCE now offers a complete new line of ballasts for utilizing the maximum light output of VHO and Power-Groove fluorescent lamps. These ballasts have been specifically designed to give cooler, quieter and more efficient operation of these new lamps.

ADVANCE VHO and Power-Groove ballasts are the result of continuous research by our Product Engineering Department to design compact ballasts for lighting fixtures and still maintain the high quality you expect of ADVANCE ballasts. Send for details.

The Heart of the Lighting Industry

ADVANCE

CBM CERTIFIED

World's Largest Exclusive Manufacturer of Fluorescent Lamp Ballasts

TRANSFORMER CO.

2950 NO. WESTERN AVE. CHICAGO 18, ILL. U.S.A.

Here's Why...

Silicone Insulated Transformers Provide Reliable Power Anywhere

Locate them anywhere near the load —on the floor, a balcony or wall . . . dry-type transformers insulated with Dow Corning Silicones are lightweight, space-saving and easy to install. They fit into any plant layout. And equally important, they cost less to install, less to maintain, far less in the long run!

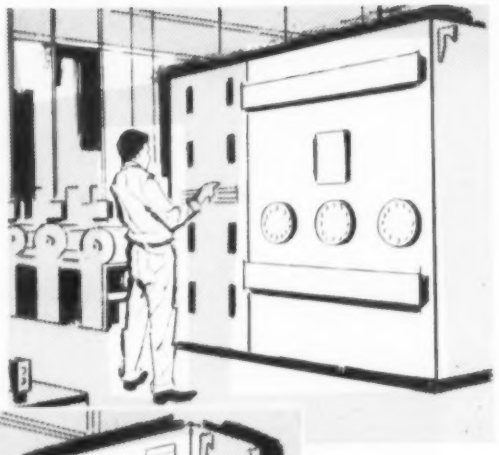
Easy, low-cost installation. Simply connect the necessary leads and throw the switch! Neither sealed nor open type silicone-insulated transformers require costly vaults, barriers or ventilating fans. And they don't contain liquids that can burn, explode or give off toxic fumes. They're completely dry, completely safe.

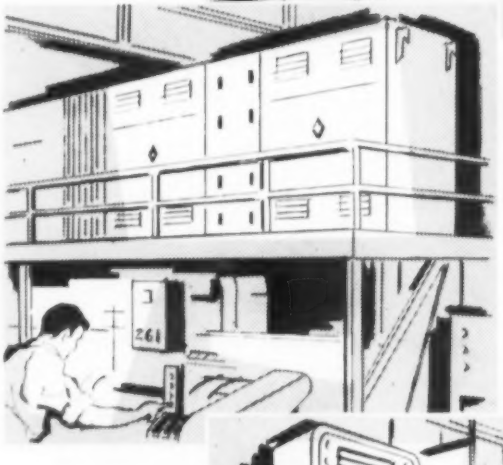
New freedom from maintenance. With no liquids to maintain or toxic fumes to guard against, you install dry-type transformers and virtually forget them. Even in open-type transformers, silicone insulation assures reliable power despite contaminated atmospheres, dust, dirt, moisture or high ambients.

Maximum reliability. Dow Corning silicone insulation has sufficient thermal capacity to handle temporary overloads up to 25% above rated capacity. This extra capacity assures the ultimate in uninterrupted, reliable power for automation . . . continuous processing . . . and all plant functions.

Send today for a list of equipment manufacturers who supply Dow Corning silicone-insulated dry-type transformers.

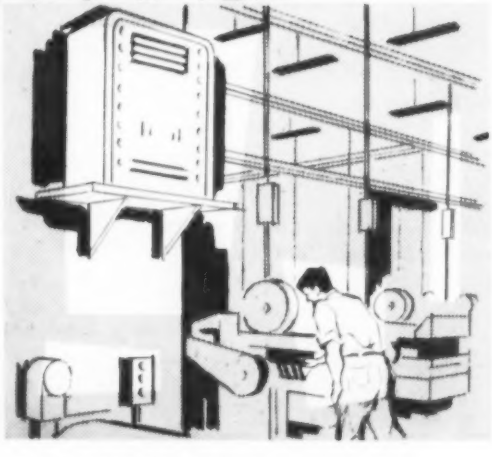
ON THE FLOOR
maximum safety; freedom from maintenance; easy to install





BALCONY
15% lighter than next lightest type; save floor loading

OR WALL
lightweight wall or platform mounted units save floor space



Specify DOW CORNING SILICONES and *Save*

first in silicones

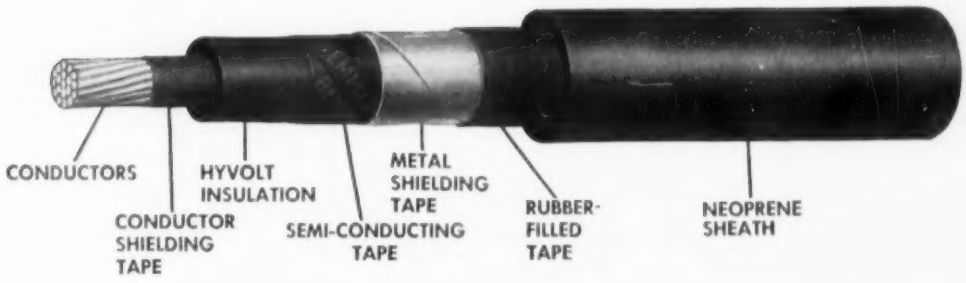
Dow Corning CORPORATION
MIDLAND, MICHIGAN

ATLANTA • BOSTON • CHICAGO • CLEVELAND • DALLAS
DETROIT • LOS ANGELES • NEW YORK • WASHINGTON, D. C.

CRESCENT

OVER 70 YEARS EXPERIENCE

HYVOLT SHIELDED POWER CABLE



For More Amperes Per Dollar of Installed Cost

ADVANTAGES

1. Long life
2. Can be operated at 85°C. Permits smaller conductors or more amperes per conductor.
3. Freedom from corona cutting
4. Excellent resistance to moisture
5. Low power factor and dielectric loss
6. Lighter, more flexible, easier to handle and install than lead covered cables
7. Electrolytic or chemical corrosion of lead sheath is eliminated by use of neoprene sheath
8. Shielding prevents possibility of surface burning and provides safety to human life.

CRESCENT HYVOLT insulation is made from butyl rubber which is inherently resistant to ozone, heat, moisture and aging. HYVOLT is formulated and processed so as to retain these inherent characteristics of the butyl rubber and at the same time provide excellent electrical and physical properties.

The insulation is protected during and after installation by an outer neoprene sheath providing a maximum degree of toughness, durability and long life. It is flame retarding and resistant to the deteriorating effects of moisture, sunlight, ozone (corona), oil, grease, and many acids and alkalies.

HYVOLT Shielding provides additional internal and external protection in these THREE WAYS

1. Conductor shielding, as provided by a semi-conducting tape over the stranded conductors, excludes air pockets between conductor and insulation and eliminates possible internal corona-cutting of the insulation.
2. The semi-conducting tape between the insulation and metallic shielding tape prevents possible ionization of air spaces and corona at the insulation surface.
3. The metallic shielding tape is grounded when installed, resulting in zero potential to ground at the sheath. It prevents surface discharge or burning, and protects cable from lighting surges. Reduces shock hazard.

RECOMMENDATIONS

CRESCENT SHIELDED HYVOLT CABLE is recommended for use in conduits, underground ducts, in wet or dry locations, or buried directly in the ground, for circuits operated at over 5000 volts and in accordance with I.P.C.E.A. recommendations. Available in single conductor or multi-conductor cables.

Specify CRESCENT SHIELDED HYVOLT POWER CABLE for general power circuits and where severe conditions are prevalent such as chemical plants, refineries, paper mills, mines, sewage disposal plants, etc. It is approved as Airport Lighting Cable Type B, CAA Specification L-824.

CRESCENT INSULATED WIRE & CABLE CO.

TRENTON 5, N. J.

How to determine proper Control Run for Remote Control Switches

With remote control switches (as with any electromagnetically operated device), it is absolutely essential that maximum allowable run for each switch should not be exceeded.

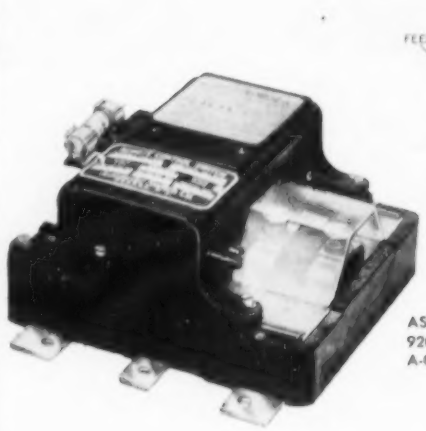
Here is a handy guide to help you determine admissible distances between switch and remotely located control station:

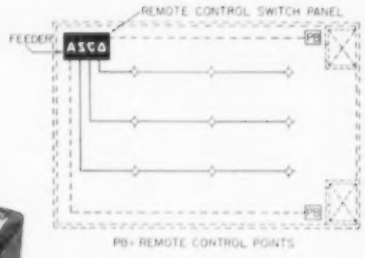
1. Doubling the control voltage will increase the allowable run with the same size of wire by about 4 times.
2. Doubling the cross sectional area of the control conductors will increase the allowable control run by 2 times. The cross sectional area of a conductor will approximately double with three gauge number sizes larger wire. Thus #14 has approximately double the area of #17, and one-half the resistance per unit length.
3. Full consideration should be given to the use of auxiliary relay control for remote control switches, particularly for group installations requiring master control and for extremely long runs.

The following tabular data specify maximum distance between control station and one Bulletin 920 switch with source line voltage at 90% of normal. Similar charts are available on the range of ASCO "remotes."

AMPERES	B&S GAUGE	DISTANCE IN FEET 110 V. 60 CYS.	220 V. 60 CYS.*
30,60,75	14	550	1600
	12	900	2600
	10	1400	4200
100,150,200	14	325	1200
	12	500	1900
	10	800	3000

*For 208 volt system, reduce 220 volt values by 30%.





ASCO 3-pole, remote control switch, Bulletin 920, is UL approved to 200 amps A-C, 600 v A-C, 250 v D-C.

Why Mechanically Held

A remote control switch is essentially a feeder disconnect switch. Consequently, it is usually installed in a lighting or power distribution panel feeding numerous circuits. In function the disconnect switch used should operate just like the manually operated type of disconnect switch—it should be unaffected by line voltage conditions and should respond only to the control of the push buttons.

Only a mechanically held switch can meet these requirements. Magnetically held contactors, which open on momentary line voltage dips and control circuit derangements, introduce the hazard of complete outage on vital circuits until repairs can be made.

ASCO Mechanically Held Remote Control Switches are unaffected by line voltage conditions; each switch includes a manual operating knob or handle so that the switches can be operated manually at any time.

The values for control run listed are for one switch. For installations involving more than one remote control switch connected to the same control conductors, the values listed can be considered as switch-feet. The allowable run for group installations will be equal to the listed values divided by the number of remote control switches operating from the same control conductors. Thus, if one switch has an allowable run of 100 feet with #14 wire, ten switches will be limited to 10 feet. When switches are located along a transmission control line, calculations in terms of switch-feet will produce the solution.

Dependable control by ASCO

New catalog 57-S2 on ASCO Remote Control Switches is now available. Write today for this basic reference on dependable electromagnetic control.

ASCO

Automatic Switch Co.

50-J Hanover Road, Florham Park, New Jersey

FRontier 7-4600

MOLDED CASE CIRCUIT BREAKERS

The I-T-E Cordon plug-in circuit breakers pictured in the control board above distribute current to machines in the Yorklyn, Del., plant of National Vulcanized Fibre Co., world's largest manufacturer of vulcanized fibre.

"We selected I-T-E breakers to solve our problem in the manner we desired," says John L. Bahr, chief engineer for National Vulcanized Fibre Co.

"I-T-E CORDON Plug-in Breakers Proved the Most Economical and Convenient Way to Meet Our Increased Power Capacity Needs"

"The growth of our company over the years required the addition of a public utilities tie line into our Yorklyn, Del., plant to supplement the plant's generating facilities. This move created two problems: it meant that we would have to substantially increase the maximum potential current interrupting capacity of our control board; and within a limited amount of space available.

"After considering several possibilities, we found that I-T-E Cordon plug-in type circuit breakers would solve both problems. We were able to satisfy our interrupting capacity requirements in the existing control board space. And plug-in features permit taking out any circuit when necessary without shutting down the entire board."

I-T-E Cordon circuit breakers combine the usual thermal magnetic trip unit for protection against overloads with current limiting Amp-traps,* which assume the fault clearing duty when actual short circuits occur. Thus I-T-E Cordon circuit breakers extend the interrupting capacity to 100,000 rms amperes without the necessity of designing special structures for maximum available shorts. Ask your I-T-E representative for complete details or write Small Air Circuit Breaker Division, 19th & Hamilton Streets, Phila. 30, Pa.

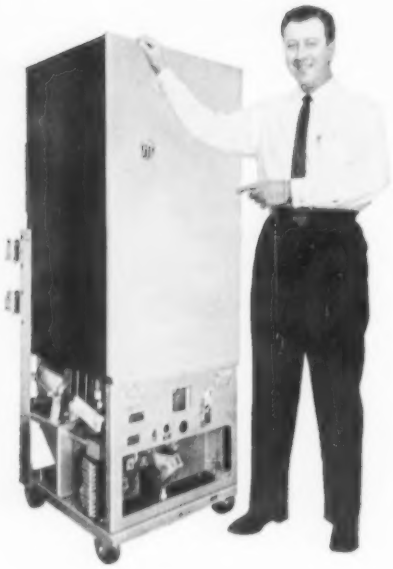
**Amp-trap is a registered trademark of the Chase-Shawmut Co.*

SMALL AIR CIRCUIT BREAKER DIVISION

I-T-E CIRCUIT BREAKER COMPANY

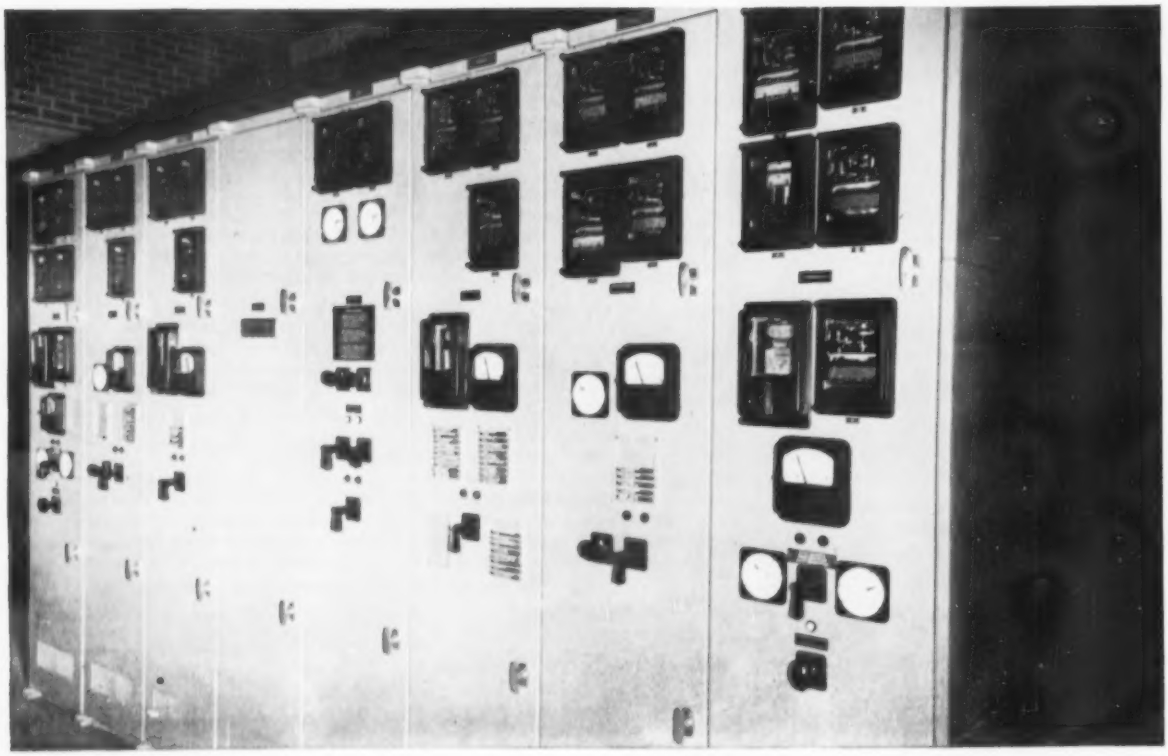
19TH AND HAMILTON STREETS, PHILADELPHIA 30, PENNSYLVANIA

First 5 kv Breaker in



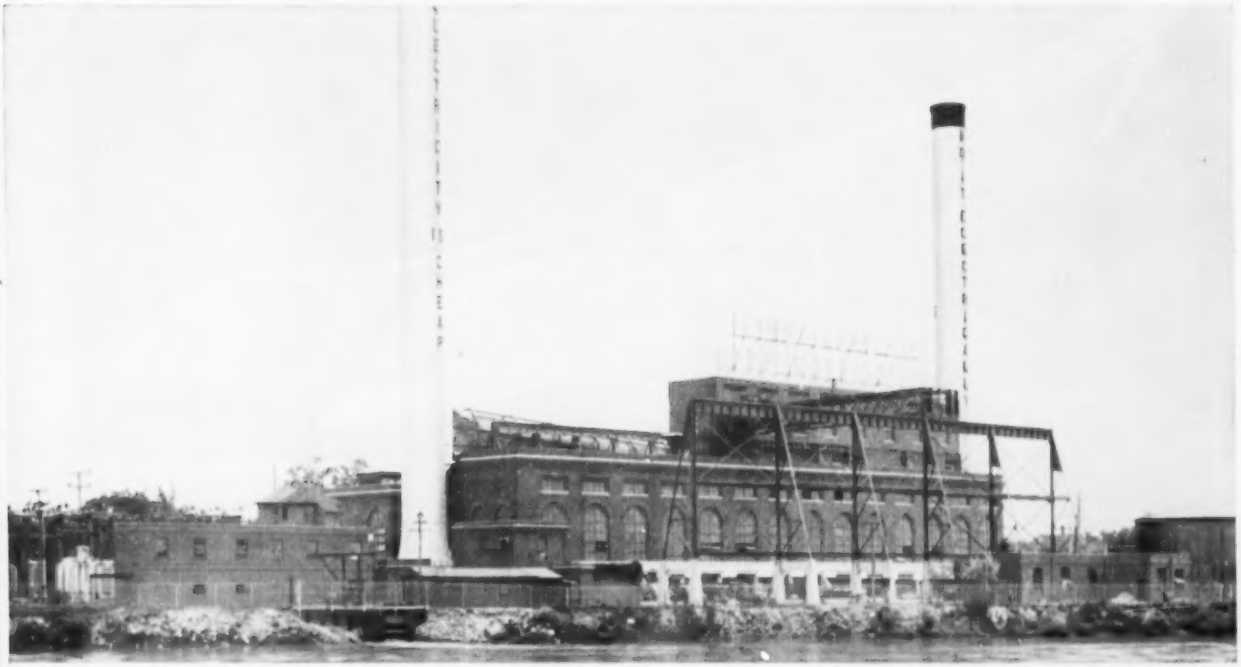
I-T-E leads again. Three installations already. More coming soon.

First 350 mva air magnetic circuit breakers to be developed in the 5 kv class. First to be installed. First to be operating. This latest electrical progress reflects I-T-E's constant effort to extend the ratings of modern metal-clad switchgear. And as with all I-T-E equipment, these new circuit breakers are made with I-T-E's traditional emphasis on sound engineering and quality construction. Available now in 1200 and 3000 amp continuous current ratings. Write for technical details on your specific application.

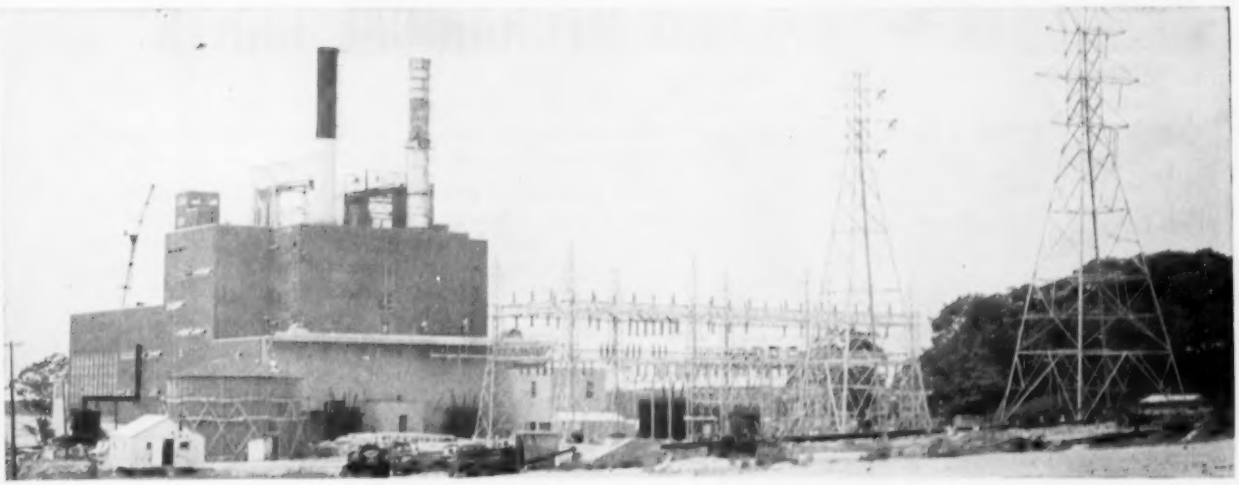


Installation at Esso Standard Oil Co., Baton Rouge, La.

350,000 kva Rating



Kansas Gas and Light Co., Wichita, Kans.



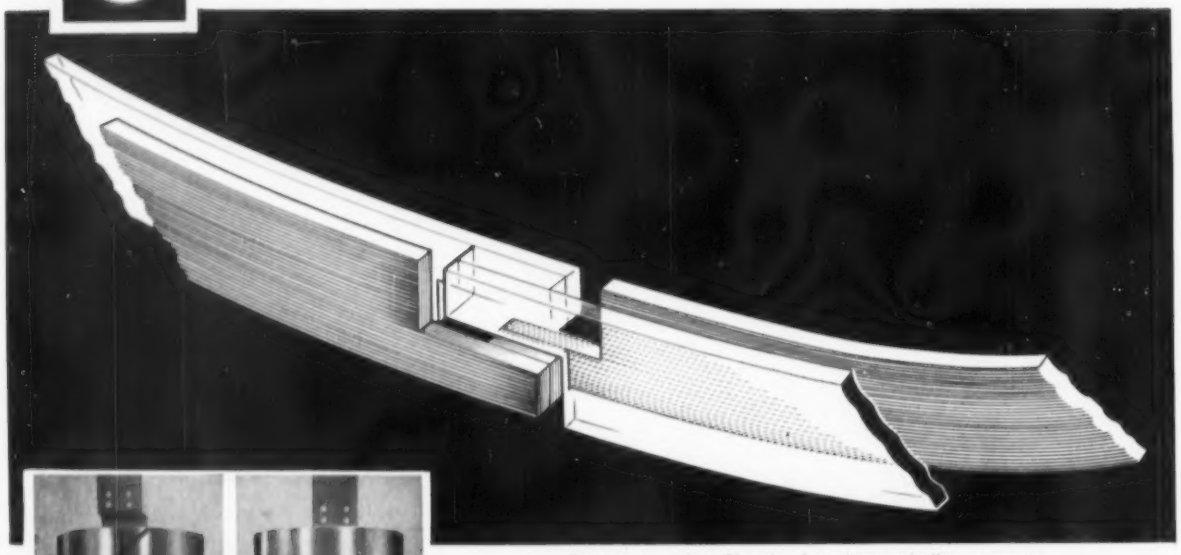
Central Maine Power Co., Augusta, Maine

SWITCHGEAR DIVISION

I-T-E CIRCUIT BREAKER COMPANY

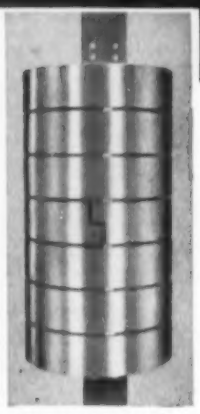
19TH AND HAMILTON STREETS, PHILADELPHIA 30, PENNSYLVANIA

UNIT SUBSTATION TRANSFORMERS



Crossover point. Showing how inner winding connects with outer winding at center of transformer secondary.

Diagonal connections between rings.



Crossover point on reverse side of transformer.

BRUTE STRENGTH SECONDARIES WOUND FROM SOLID BUS— NO MECHANICAL JOINTS

Completed dry-type transformer mounted in ventilated housing.

From one end of the secondary to the other in these I-T-E unit substation transformers, electricity flows through solid copper bus bar.

This is a unique design for high current secondary windings embodying great structural strength, plus low reactance and high conductivity. Lengths of copper bus, cut on a diagonal and formed into rings, are brazed together below the diagonal gap in such a manner as to form a continuous electrical winding.

Where greater current carrying capacity is required, two such windings are paralleled, but a crossover at the midpoint causes each of the parallel paths to have half its turns in the outer layer and half in the inner—equalizing the impedance of the two parallel paths and distributing the reactance evenly.

Write for complete information. I-T-E Circuit Breaker Company, Transformer & Rectifier Division, 19th & Hamilton Streets, Philadelphia 30, Pa.

I-T-E CIRCUIT BREAKER COMPANY

Transformer & Rectifier Division

ELECTRICAL CONSTRUCTION AND MAINTENANCE

57th Year — DECEMBER • 1957

Good Prospects for '58

Construction outlook estimates of the Departments of Labor and Commerce for 1958 anticipate record construction expenditures of $49.6 billion, 5% above 1957. In physical volume, it is expected that next year will be the second highest, exceeded only by 1955.

The forecast, released by the Bureau of Labor Statistics and the Office of Construction Statistics last month, should allay some year-end jitters about the prospects for next year. Historically, the "construction outlook" has predicted the trends in the industry for many years with reasonable accuracy.

The picture is particularly good for electrical construction. Given a fairly stable base of new building, the market for electrical work is being pushed upward by advancing technical requirements taking a larger share of the building dollar.

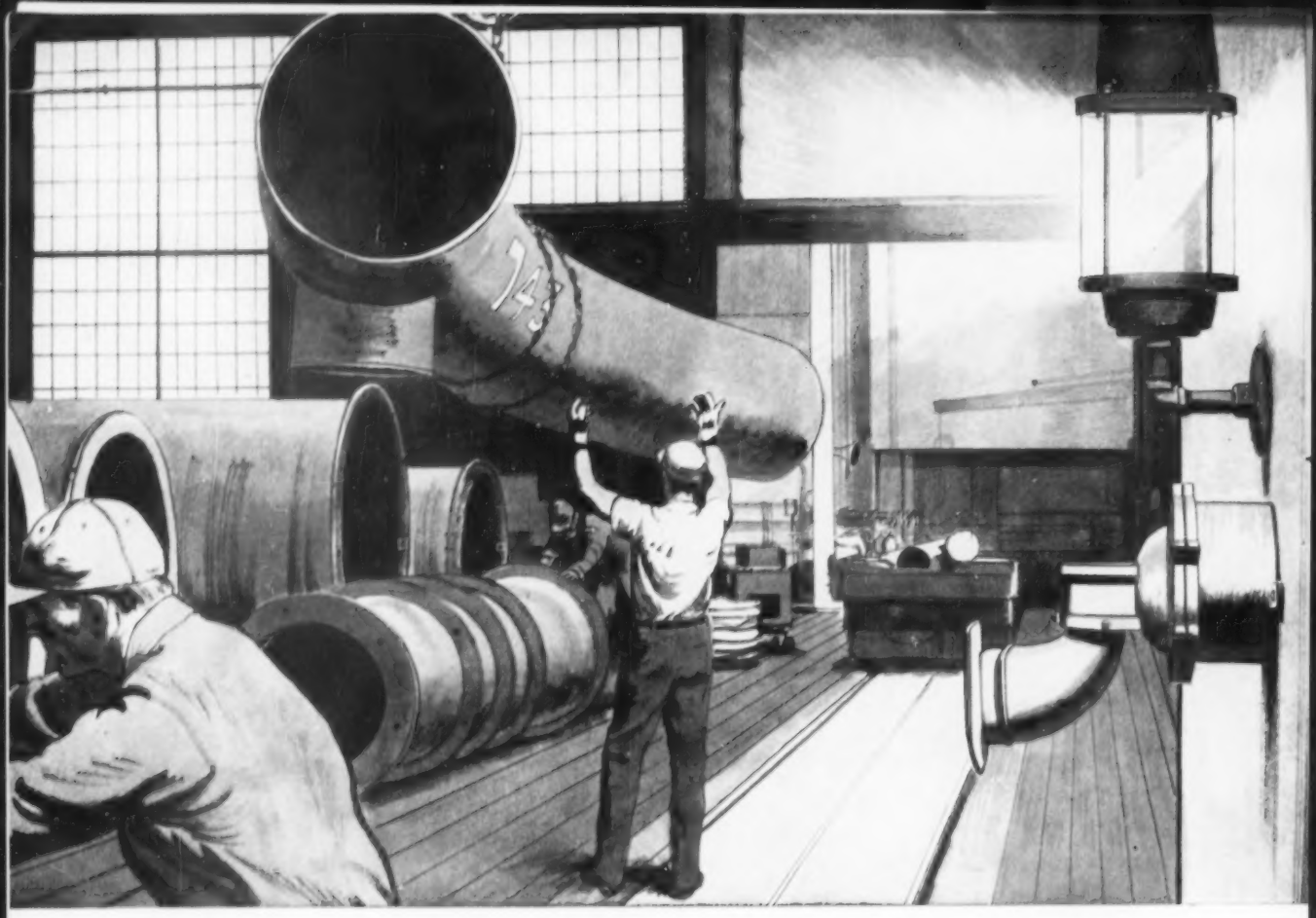
Housing, for example, is expected to reverse its recent downward trend and advance strongly in 1958. But these houses will also be much better wired, on the average, than ever before. A large percentage will have 100 amp or better services and 12 circuits or more. And most will have more and better lighting fixtures than past practice provided.

There will be a continued increase in office building construction and at least a continuation of the 1957 level in the building of stores. But improvements in lighting standards and the now practically universal requirements for air conditioning need electrical systems considerably advanced in complexity and capacity from the practices of only a few years ago.

The list could go on. There will be fewer industrial buildings erected, but these will certainly be more heavily electrified. There will be a sharp rise in utility construction, especially electric power. There will be gains in highway construction and consequently, highway lighting. From any aspect the outlook is clearly favorable for next year's business activity in the electrical construction field.

The good market prospects ought to discourage risky bidding on thin margins. It will almost certainly stabilize the currently soft price picture on some materials. There is ample volume in sight to challenge the full capacity and labor force of the industry. It is a market in which the electrical contractor ought to be able to ask for and get a fair return to net for the valuable services he renders.

Wm. T. Stuart



Your customers may need audible and/or visual signaling facilities for paging or warning. They may need intercom for a dozen different industrial conditions. You can meet *every* signaling need by calling Graybar.

How to plan SIGNALING that will

LOCATE—WARN—PHONE

anyone, anywhere in the plant—or out

New construction, additions or modernization may confront you with signaling problems. By calling *Graybar first*, you'll get the facts on the newest and finest developments of such leaders as USI on sound powered telephone; Edwards code-paging and calling systems; Webster intercom, Federal signals and Sperti Faraday annunciators and clocks for every usual and specialized condition.

Calling Graybar enables you to fill *every* signal *need from one single, convenient source*. Your Graybar Signaling Specialists make it their business to know the special advantages of all the latest equipment.

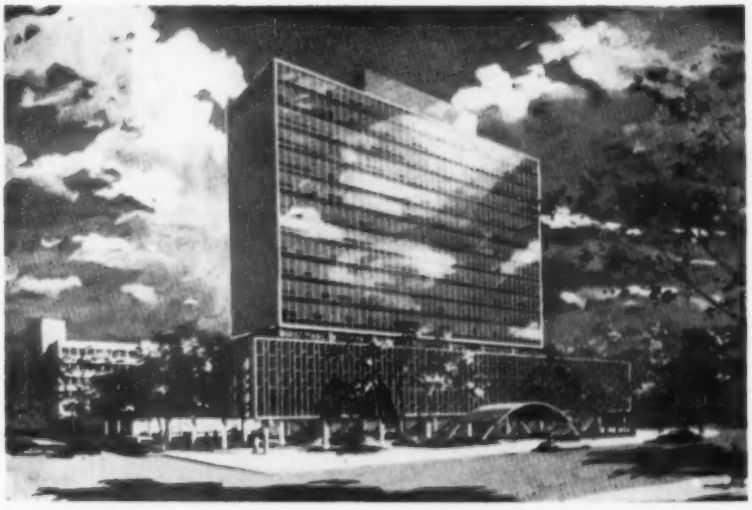
Remember, too, that Graybar distributes *everything electrical* for wiring, lighting, power and ventilation. 682-412

Everyone who plans, uses or installs signaling equipment can use a copy of this free Signaling Selection Guide, produced by the Federal Sign and Signal Corporation. If you are located in the U. S. or possessions, write for your copy.

CALL **GraybaR** FIRST FOR

GRAYBAR ELECTRIC COMPANY, INC., 420 LEXINGTON AVENUE, NEW YORK 17, NEW YORK. IN OVER 130 PRINCIPAL CITIES

ELECTRICAL CONSTRUCTION AND MAINTENANCE



By J. F. McPartland

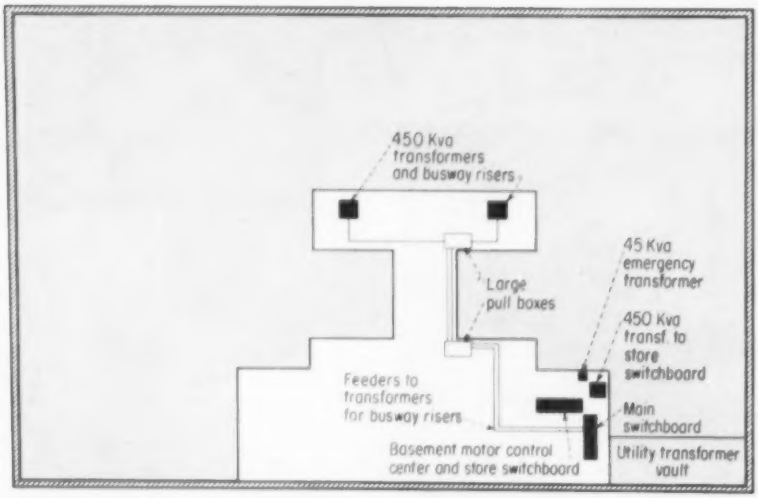
Busway distribution highlights design for . . .

POWER IN A MEDICAL BUILDING

A study of modern design details and construction methods in the electrical system for an 18-story medical office building in Houston, Texas. Electrical design was done by Bernard Johnson and Associates, consulting engineers, Houston, Texas. Hirsh Electric Company was the electrical contractor.

ELECTRICAL distribution in The Medical Towers building, Houston, Texas, includes a variety of modern and interesting design details. The installation is significant in that it represents a prototype of a new kind of building. Medical Towers contains office space for the full range of doctor-specialists, including medical facilities for complete treatment and care of outpatients. Such concentration of medical facilities in a single building makes this a hospital-without-bed-patients and is a fast growing trend throughout the country. The electrical system here serves heavy lighting loads, motor loads and special appliance and equipment loads. A close look at the system points up its compactness and full capacity for load growth. Electrical design was done by Weldon Henderson of Bernard Johnson Associates.

Medical Towers is an eye-catching 18-floor office building which adds to the impressive skyline on the south side of downtown Houston. The building contains a basement which houses main electrical distribution equipment; parking space on the second, third and fourth garage floors (with ramps to these floors from the street); 13 floors of actual office space; and roof mechanical facilities. The building is rectangular in plan, with the lower parking section larger in cross section area than the main


450 Kva transformers and busway risers
45 Kva emergency transformer
Large pull boxes
450 Kva transf. to store switchboard
Feeders to transformers for busway risers
Main switchboard
Basement motor control center and store switchboard
Utility transformer vault

BASEMENT PLAN shows layout of major distribution equipment. Overall rectangular outline is plan of building at ground level. Basement does not include area which is shaded. Majority of mechanical equipment for building facilities—air compressors, water chillers, water pumps, circulating pumps and refrigeration equipment—is in basement and supplied from the motor control center there.

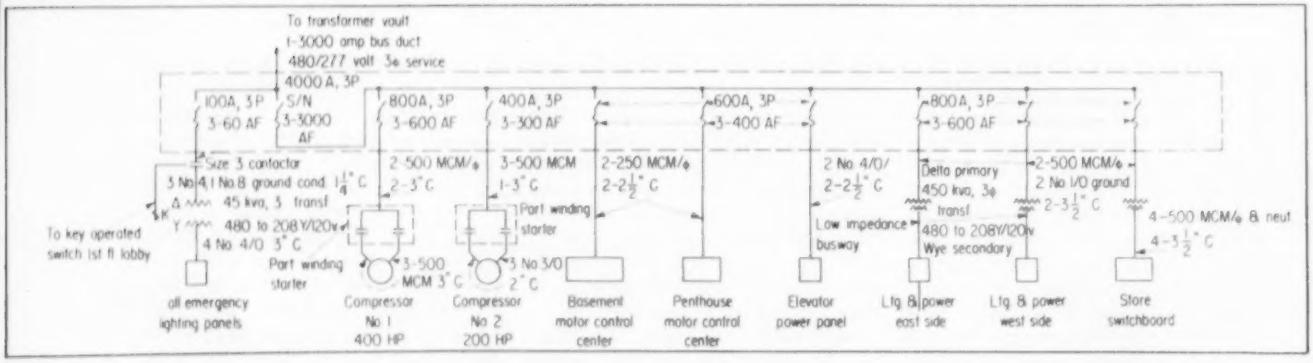
SERVICE ENTRANCE busway comes through building wall from utility transformer vault adjacent to basement. This run of 3000-amp busway carries power at 480y/277 volts, 3-phase, 4-wire into the main building switchboard in lower left of photo. A 1-in. thick ebony fire barrier is shown around the opening through which the busway comes into the basement. A similar barrier is also used on the vault side of the wall.

office section of the building. Electrical distribution throughout the building follows a symmetrical layout as a result of the simple building shape.

Electric energy is supplied to the building at 480y/277 volts, 3-phase, 4-wire from a utility transformer vault in the basement. From the main switchboard in the basement, adjacent to the utility vault, 480-volt, 3-phase power is delivered directly to motor loads in the basement, on the two lower floors and on the 18th floor. For general power and lighting throughout the building, feeders are derived from transformers in the basement. These transformers are 3-phase units connected 480-volt delta primary to 120/208-volt, 3-phase, 4-wire secondary.

Although the supply to the building is made at 480y/277 volts, design analysis clearly ruled against this voltage level for general power and light circuiting using 277-volt fluorescent lighting with local step down to 120-volt loads. The amount of 120/208-volt power and lighting loads represented in the medical appliances, lamps and other devices would have required total capacity of local transformers costing much more than the copper and other savings at 480y/277. The amount of load which could have been served at 480y/277 was very small by comparison to 120-volt loads. Vertical distribution at 120/208 volts, using basement-mounted transformers for stepdown, was found to be more economical and effective in this case. And it should be noted, 120/208-volt distribution was more economical here even though transformation had to be made from 480. The usual com-

MAIN SWITCHBOARD is an enclosed, safety-type, fused-switch board with service busway coming into top of main switch section at extreme right in photo. Single-line diagram shows makeup of main switchboard and basic distribution scheme throughout the building.


To transformer vault
1-3000 amp bus duct
480/277 volt 3φ service
4000 A, 3P
100A, 3P 3-60 AF
S/N 3-3000 AF
800A, 3P 3-600 AF
400A, 3P 3-300 AF
600A, 3P 3-400 AF
800A, 3P 3-600 AF
Size 3 contactor
3 No 4, 1 No 8 ground cond. 1¼" C
45 kva, 3 transf
480 to 208Y/120v
4 No 4/0 3" C
To key operated switch 1st fl lobby
2-500 MCM/φ 2-3" C
3-500 MCM 1-3" C
2-250 MCM/φ 2-2½" C
2 No 4/0/ 2-2½" C
Delta primary 450 kva, 3φ transf
480 to 208Y/120v Wye secondary
2-500 MCM/φ 2 No 1/0 ground
2-3½" C
4-500 MCM/φ & neut 4-3½" C
Part winding starter
Low impedance busway
3-500 MCM 3" C
3 No 3/0 2" C
all emergency lighting panels
Compressor No 1 400 HP
Compressor No 2 200 HP
Basement motor control center
Penthouse motor control center
Elevator power panel
Ltg & power east side
Ltg & power west side
Store switchboard

EMERGENCY TRANSFORMER in basement is a 45-kva, 3-phase unit rated for 480 delta to 120/208y. It is supplied from a 100-amp, 3-pole switch with 60-amp fuses mounted in the main switchboard and tapping ahead of the 4000-amp main switch. The primary supply to the transformer consists of three No. 4's and a single No. 8 ground conductor (for connection to the secondary neutral point) in a single 1¼-in. conduit. The primary conductors are carried through a size 3, 480-volt magnetic contactor shown on wall with a 480/120-volt control transformer above it to provide a 120-volt control circuit. The contactor is controlled by a key-operated emergency lighting switch in the main lobby. The secondary consists of four No. 4/0's in a 3-in. conduit shown at left of transformer. This conduit becomes a riser through the whole building, adjacent to one of the main busway risers.

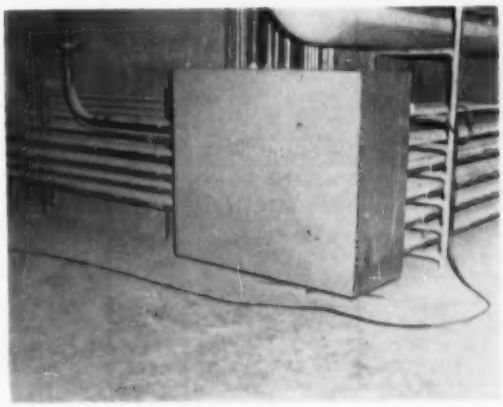
parison of relative economies of the two types of systems is made on the assumption of direct availability of either type of service.

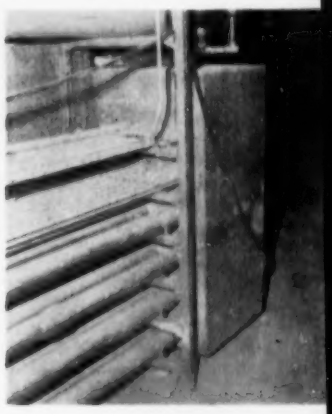
The layout of the main switchboard is shown in an accompanying diagram. One feeder from the main switchboard is carried to the primary of a nearby 450-kva, 3-phase dry type transformer and from the 120/208-volt, 3-phase, 4-wire secondary to a two-section store switchboard. This board supplies panels in store rental spaces, a panel in the basement and panels on the first floor and garage floors. These panels in turn provide circuits for all of the 120/208-volt loads in the lower part of the building.

Emergency lighting throughout the building is supplied by a 45-kva, 3-phase, 480-volt to 120/208-volt transformer in the basement. This transformer is tied into the main switchboard ahead of the 4000-amp main switch. From it feeders are run vertically to emergency lighting panels on the upper floors.

The major part of the 120/208-volt general lighting and power load—from the 5th floor to the 17th floor—is supplied by two busway risers fed from the main switchboard. These risers are identical and divide the total load. One riser handles the east side of the building; the other, the west side. Each riser is carried up at the approximate load center of one half of the building.

As shown in the riser diagram, each main riser originates at a 450-kva, 3-phase—480-volt delta primary to 120/208-volt wye secondary—transformer in the basement. Each of these transformers is supplied by a multiple conductor feeder made up of three 500 MCM phase conductors and one No. 1/0 grounding conductor in each of two





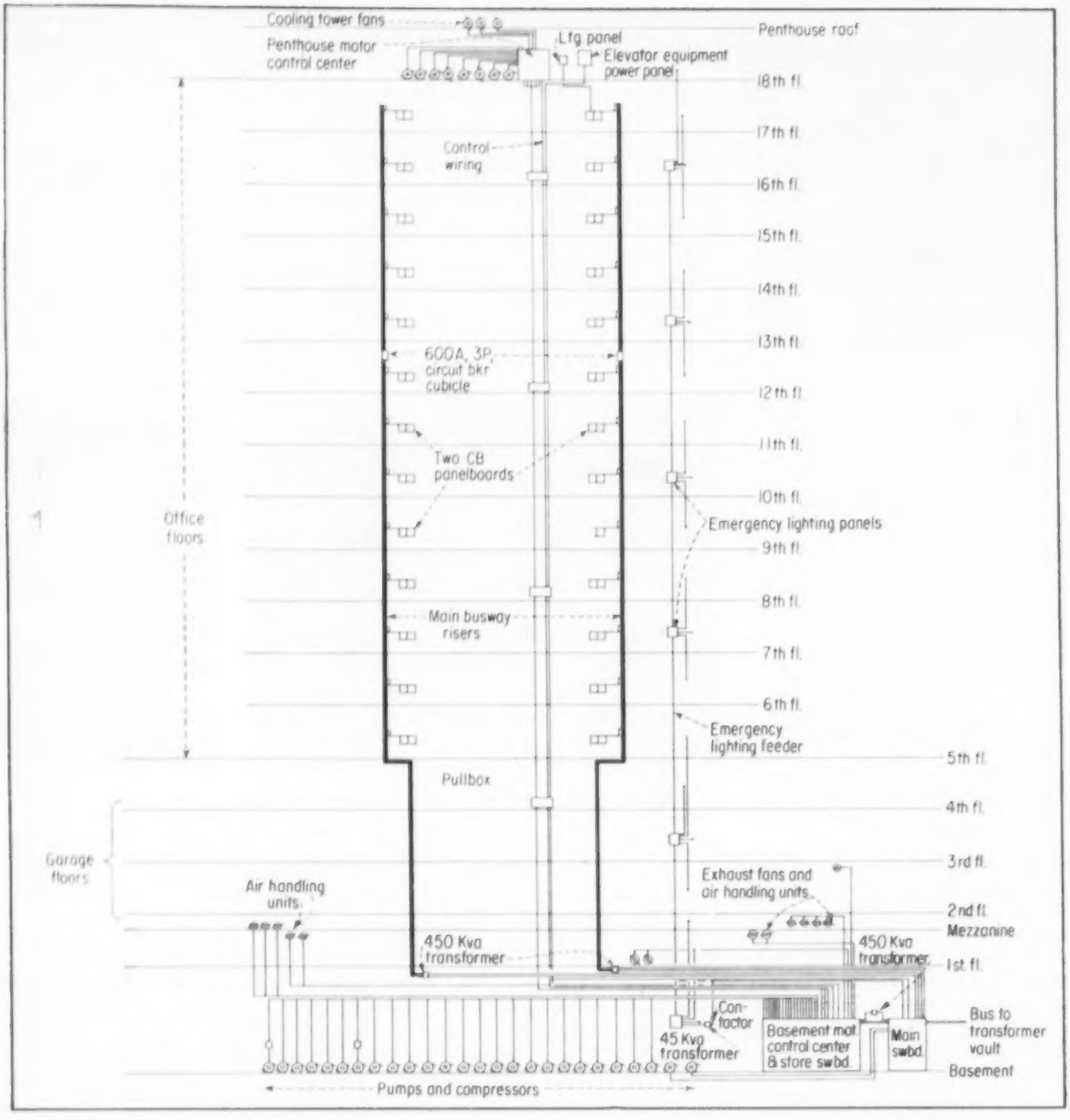
TWO PULLBOXES are used for right angle turns in various conduit circuits coming from main switchboard, basement motor control center, air conditioning control panel, store switchboard and emergency transformer (all out of sight around corner at right) and running to riser spaces (out of sight) where conduit risers originate to penthouse motor control center, elevator power panel on 18th floor, emergency lighting panels and various motor loads and lighting panels on the lower floors. As shown, all conduits are neatly racked on channel framing, with each conduit held by a clamp in the channels of the horizontal members of the frames. These large, floor-mounted boxes are indicated in the diagram of the basement equipment layout.

3½-in conduit runs from the main switchboard. The primary feeder has a 640-amp capacity in this arrangement compared with only 455 amps if a single conductor of equal cross section—1000 MCM—had been used per phase. The primary feeder for each transformer is protected by three 600-amp fuses in an 800-amp, 3-pole disconnect switch in the main switchboard. An interesting point might be noted here: Although the code does not require a disconnect for feeders, it does require a disconnect for fuses used to protect feeders (Sec. 2440).

In each riser circuit, the transformer is located to provide voltage level change at the point where the riser starts, even though this point is over 150 ft away from the main switchboard. The advantage lies in the economical use of the 480-volt level to keep copper requirements low for as great a length as possible. The transformers are enclosed, dry-type units with no internal switching or protective equipment. The 600-amp feeder fuses in the main switchboard provide overcurrent protection for the transformer—"primary circuit overcurrent device" . . . "rated or set at not more than 250% of the rated primary current of the transformer." Rated primary current in this case is approx. 540 amps.

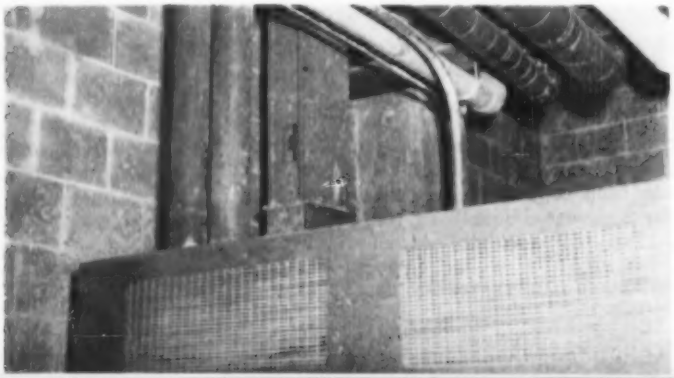
The No. 1/0 grounding conductors carried to each transformer in the conduits with the primary feeder are used to ground the neutral point of the 120/208-volt wye-connected secondary. Grounding of the 120/208-volt system is mandatory and ground must be connected at the source—the transformer secondary. The 1/0 conductors are carried from the secondary neutral point back to the main switchboard from which the system ground is made to a water pipe.

From the secondary of each of



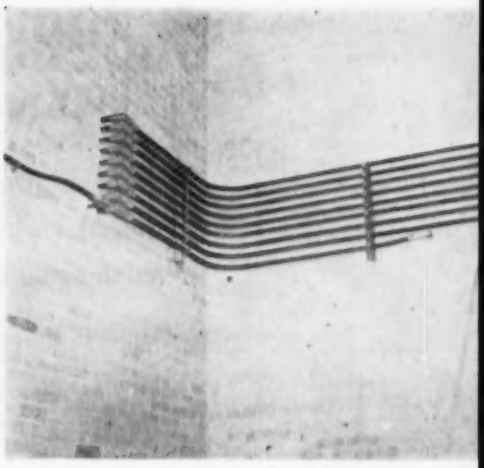
RISER DIAGRAM shows basic distribution throughout building, from basement to penthouse. Offset in busway run along ceiling of fourth floor was made to bring risers into convenient space for vertical passage through center of floor loads.

TRANSFORMER CONNECTIONS on one of the dry-type 450-kva units are made through the top of the enclosure. Two 3½-in. conduits coming down into top carry the multiple conductor feeder to the delta connected primary winding. Right next to the conduit is the 120/208-volt busway riser which runs to the top of the building to supply general light and power from the 5th to the 18th floors.

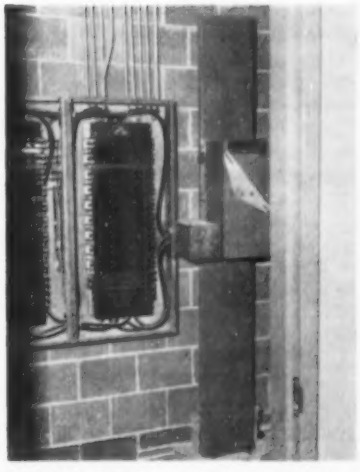


the transformers a low-impedance type busway riser runs up through the building, making an offset on the ceiling of the fourth (garage) level to bring the run into riser space at floor load centers. From the fifth floor up, the two busway runs are straight to the 17th floor. An interesting element in each busway run is the reduction in size of busway from the 12th floor up. From the fifth to the 12th floor, the busway consists of two ¼-in. by 4-in. bars per phase with one ¼-in. by 4-in. neutral bar. This run of busway is protected by the 600-amp

BUSWAY OFFSET is made along ceiling of fourth floor parking area. Busway comes up behind wall at right, from the top of one of the basement-mounted 450-kva transformers. Busway runs back as shown and then turns up to make a straight rise to 17th floor.



MOTOR CIRCUITS for equipment in penthouse and cooling tower on 18th floor are derived from penthouse motor control center (at left) which is fed from the main switchboard in basement and contains seven combination starters in the elevation shown and two more combination starters and two 150-amp fused disconnect switches on the opposite side. Starters on wall to right of control center are 100-hp, 480-volt starters for the building's primary air fans. These are fed from the 150-amp fused disconnects in the control center. Other circuits from the center include: three 15-hp cooling tower fans, two 2-hp exhaust fans, two 1½-hp fire pumps and ½-hp makeup water pump. Conduits from control center are carried through wall as shown and then routed along outside of building to locations of individual motor loads where the conduits again re-enter the building. Outside conduits are shown, in photo at right, coming out of the wall and supported by clamps set in channel frame members bolted to the brick wall. This method was chosen as the quickest, most direct route to motor loads. The part of the building wall shown is along a setback on which the cooling tower is mounted.



BUSWAY TAP shown here in an electric closet is on the 17th floor, at the top end of the 600-amp, reduced busway extension. Layout for both risers, on all floors, is nearly identical to this. The two panelboards are supplied from the busway through the 225-amp CB shown. Most of the circuits in the panels supply receptacle outlets—both 120-volt outlets and 208-volt, single-phase outlets—for general appliance loads and special loads such as x-ray equipment. General-purpose receptacle circuits are loaded with 2, 3, 4, 5 or 6 outlets, depending upon the location of the outlets. Each 208-volt receptacle is supplied by an individual circuit. Spare capacity in all panels will accommodate substantial load growth.

fuses in the main switchboard. Through the transformer, these fuses protect the busway run at 1380 amps. From the 12th to 17th floors, 600-amp busway is used to supply the floor panels while effecting a copper economy by reduction in the size of bus copper. This 600-amp busway extension is made from an adapter cubical with a 600-amp circuit breaker to protect the lower current capacity.

On each floor, from the 5th to the 17th, one busway riser is tapped to supply the east side of the floor, and the other busway riser to supply the west side. Each riser is tapped by a 225-amp CB, as shown in an accompanying photo. This tap supplies two lighting and appliance panelboards in parallel. Because the panelboards are tapped from feeders with overcurrent protection in excess of 200 amps, the tap CB's are required and must not be rated in excess of the rating of the panelboard main buses.

It should be noted that the nature of the loads on these panelboards called for skillful application of demand factors in arriving at the size and method of taps on the busway. Demand factors also figured significantly in the sizing of the busway runs. Of course, the unusual nature of this building's activity accounts for the important consideration of demand factors. With a large number of small rooms to be individually lighted and supplied with general purpose convenience receptacles, electrical demand had to be carefully related to utilization patterns of the occupants. From the standpoint of type of occupancy, this building is a combination office-hospital building. The table in section 2203 of the NEC gives the minimum demand factors for both office and hospital buildings.

From the design details given, it is obvious that the engineering for a new type of building calls for thorough predesign analysis of the nature of the occupancy. Only from full understanding of the building's activities can a system be laid out to meet both present and future requirements, with required flexibility.

Golemon and Rolfe, Houston, Texas, were architects of this building. The firm of Skidmore, Owens and Merrill were consulting architects.

Judges Select Winners In

Nine lighting authorities review 244 entries in the 1957 International Lighting Competition, select 106 lighting installations for cash prize awards, designate 29 others for honorable mention.

THE 1957 International Lighting Competition closed October 25, as planned, and entries were judged on November 4th and 5th. A total of 244 entries had been completed and mailed in. Of these, 135 were awarded cash prizes and honorable mention awards by the nine nationally known lighting authorities who served as judges.

The nine individuals who judged these entries were divided into three groups to do this job. This cut down the number of entries to be reviewed by each group, and also made it possible to select individuals to appraise different types of lighting application who were best qualified in these fields. The six classifications used for the various types of lighting installations in the contest were thus divided into three groups, and three judges assigned to each group.

Group A entries included industrial, store, office and institutional lighting installations. A total of 181 entries were submitted in this group. Judging of these entries was done by Carl W. Zersen, Chairman, Managing Director of the Chicago Lighting Institute, Chicago; C. M. Cutler, in charge of General Lighting Applications, Large Lamp Department, General Electric Co., Nela Park, Cleveland; and Russell C. Putnam, Professor of Electrical Engineering, Case School of Applied Science, Cleveland.

Group B entries included all types of outdoor lighting, such as street and highway lighting, and recreational, spectacular, protective and other utilitarian and decorative floodlighting. There were 38 entries submitted in this class. These were judged by C. L. Crouch, Chairman, Technical Director of the Illuminating Engineering Society, New York; Everett M. Strong, Professor of Electrical Engineering, Cornell University, Ithaca; and Charles H. Goddard, Vice President, Voicewriter Division, Thomas A. Edison, Inc., West Orange, N. J. Mr. Strong and Mr. Goddard are both past presidents of the Illuminating Engineering Society.

Group C entries included all residential lighting entries, covering the lighting of an entire house or any part thereof, as well as exterior and garden lighting. There were 25 entries submitted in this class, and these were judged by Miss Myrtle Fahsbender, Chairman, Director of Residential Lighting for Westinghouse Lamp Division, Bloomfield, N. J.; William F. Little, Past-President (retired), Electrical Testing Laboratories, Inc., New York, N. Y.; and Edward A. Campbell, Manager, Better Light Better Sight Bureau, New York.

Prize Awards

Of the 135 total awards, 106 were cash prize awards made to 136 contestants, and 29 were honorable mention awards made to 42 contestants. Of the cash prize awards, 77 were for "individual" entries and 29 were for "joint" entries. Also, of the honorable mention awards 16 were for "individual" entries and 13 were for "joint" entries. There were 24 first prize awards ($100 each), 23 second prize awards ($50 each), and 59 third prize awards ($25 each), totaling $5,025. In case of "joint" entries, the cash award will be divided among the two or more contestants submitting the entry.

Highlights of Competition

The number of lighting installations entered in this contest was 377. But 133 contestants failed to send in their completed entry, that is, the official entry folder which was mailed to each contestant upon receipt and approval of his entry application.

WINNING ENTRIES lists are presented to Competition Chairman by Group A and Group B Panels of judges. Carl W. Zersen, Chairman of Group A Panel goes over list of winners in industrial, store, office and institutional lighting classifications with Berlon C. Cooper, Competition Chairman, while C. L. Crouch, Chairman of Group B Panel (holding list of winners) waits his turn. Others looking on are (l. to r.): Russell C. Putnam, C. M. Cutler, Everett M. Strong, Charles H. Goddard, and Laurence C. Messick, Director of National Lighting Bureau, NEMA.

LIGHTING COMPETITION

By Berlon C. Cooper

The competition was essentially four contests in one—electrical contractor, electrical distributor, architect/engineer, and electric utility. Entries were submitted in each of the six lighting installation classifications (industrial, store, office, institutional, outdoor, residential), and in any one of the four contestant divisions. Five cash prize awards were offered for each installation classification and in each contestant division (30 cash prize awards per contestant division, 120 cash prize awards total). Thus entries in one division did not compete with those in another division. That is, electrical contractor entries on store lighting, for example, did not compete with electrical utility entries on store lighting.

This contest was international in scope. Awards went to contestants in 30 states, the Netherlands, Australia, and Canada. Pennsylvania held first place, with 46 lighting installations entered, 32 entries completed and mailed in, and 18 awards. Texas placed second, with 22 lighting installations entered, 17 entries completed and mailed in, and 12 awards. Michigan placed third in awards, with 11 awards received, and New York fourth with 10 awards received. Three states tied for fifth place, each with nine awards received—California, Massachusetts, and Wisconsin. California placed second in number of lighting installations entered, however, with 33 jobs entered, and 22 entries completed and mailed in.

The Philadelphia area was top scorer for any one community. It accounted for 32 lighting jobs entered, 25 entries completed and mailed in, and 15 prize awards. These awards included four first prizes, one second prize, eight third prizes, and two honorable mentions.

Individual high scorer for the contest was Everett H. Schaefer, lighting specialist for the Wisconsin Electric Power Company, Milwaukee, Wis. He entered ten lighting installations, which won six awards—two "first" prizes, two "third" prizes, and two "honorable mention" awards. All of his entries were made jointly with co-contestants. Second high scorer, based on number of awards won, was S. J. Brochstein, store designer of Houston, Texas, on joint entries made with H. G. Hrivnatz, lighting engineer, Houston Light & Power Company as co-contestant. This team entered seven store lighting jobs in the "Architect-Engineer" Division and won five awards—one "first", one "third", and three "honorable mentions".

International Awards

Six awards were won by entries covering lighting installations in other countries. One of these was a second prize award for an industrial lighting installation in Brisbane, Australia, submitted in the Wholesale Distributor Division. Another was a third prize award for a residence in Vlaardingen, Holland. And four awards went to Canada—a first prize award for a library lighting job in Hamilton, Ont. (electrical contractor); an honorable mention award for a theatre in Montreal (consulting engineer); a third prize award for an office lighting job in Quebec (electric utility); and a third prize award for a monument floodlighting installation in Quebec.

Award Presentations

Cash prizes and Award Certificates will be presented to winning contestants, insofar as is practical, at an early local meeting in the contestant's own community. Efforts are already under way to arrange for time on programs of local electrical groups, or of local Section or Chapter meetings of the Illuminating Engineering Society, to make these awards publicly.

Most of the first and second prize entries will be published in forthcoming issues of the McGraw-Hill electrical publications which co-sponsored this competition.

The 1957 International Lighting Competition was a joint venture between the National Lighting Bureau of the Commercial and Industrial Lighting Equipment Section of the National Electrical Manufacturers Association and three McGraw-Hill electrical publications — *Electrical Construction and Maintenance*, *Electrical Wholesaling*, and *Electrical World*. It was planned "to foster and encourage the design, sale, installation and use of better lighting for maximum seeing comfort in the home, at work and at play; and to stimulate greater interest and activity toward continuing progress in electrical illumination".

Prize Winners in ELECTRICAL CONTRACTOR DIVISION

PRIZES	CONTESTANTS	INSTALLATIONS
INDUSTRIAL LIGHTING		
First	A. Walker (EC) Union Electric Co., Philadelphia, Pa. George Swint (E) Precision Tube Co.	Precision Tube Co., North Wales, Pa.
Second	Carl Abrams (EC) Allen Electric Co., Inc. Paterson, N. J. Harry W. Terry (CE) Trenton, N. J.	Niagara Box Factory, Fair Lawn, N. J.
Third	Edward Morse (EC) Morse Electric Co.	Bersell Tool & Die Corp. South Bend, Ind.
Third	Joseph M. Burkhart (EC) Chula Vista Electric Co. Chula Vista, Calif.	Convair Plant 19 Buildings 1, 2, and 3 San Diego, Calif.
Third	H. M. Gibbs (EC) Hall Engineering Company	American Metal Products Co Detroit, Mich.
Honorable Mention	William J. Rudolph (CE) Rudolph Electric Co. Chelsea, Mass. Norman E. Ticehurst (EU) Cambridge Electric Light Co.	Colonial Engineering Co. Cambridge, Mass.

PRIZES	CONTESTANTS	INSTALLATIONS
STORE LIGHTING		
First	A. J. Hasson (EC) Phoenixville, Pa. Arthur V. Schafer (EU) Philadelphia Electric Co.	Jerry's Supermarket Phoenixville, Pa.
Second	Edward J. Stewart (EC) E. J. Stewart, Inc. Robert Hirsch (EW) Morristown Electrical Supply Co.	M. Epstein, Inc. (Dept. Store) Morristown, N. J.
Third	Edward B. Barber (EC) Independent Wiring Co. George T. Anderson, Jr. (EU) Philadelphia Electric Co.	B. F. Dewees Philadelphia, Pa.
Third	John Staff (EC) Staff Electric Co.	Carpet's, Inc. Milwaukee, Wis.
OFFICE LIGHTING		
First	H. E. Fraser (EC) Langford Electric Corp. L. W. Johnson (CE) Thorshev & Carny	American Hardward Mutual Ins. Co. Minneapolis, Minn.
Second	Walter N. Parkes (EC) T. H. Green Electric Co. Rochester, N. Y.	Garlock Packing Co. Palmyra, N. Y.
Third	William J. Rudolph (EC) Rudolph Electric Co. Chelsea, Mass. Norman E. Tickhurst (EU) Cambridge Electric Light Co. Cambridge, Mass.	Colonial Engineering Co.
INSTITUTIONAL LIGHTING		
First	J. D. Harrison (EC) Bennie Electric, Ltd.	West End Library Hamilton, Ontario (Canada)
Second	Charles A. Holm (EC) Prospect Park, Pa.	Upland Baptist Church Upland, Pa.
Third	Sidney Rosset (EC) Marsh Electric Co. Benjamin H. Stein (A) Chicago, Ill.	Arlington Park Jockey Club Arlington Heights, Ill.
OUTDOOR LIGHTING		
First	Edward B. Barber (EC) Independent Wiring Co. G. William Wagner (EU) Philadelphia Electric Co.	Washington Fountain Monument Philadelphia, Pa.
Second	Richard S. Beckford (EC) Beckford Bros., Electricians Haverhill, Mass.	Mayflower Reception Celebration Plymouth, Mass.
RESIDENTIAL LIGHTING		
First	S. S. Snyder (EC) Snyder Electric Service	Electric Living Home Greensboro, N. C.

PRIZES	CONTESTANTS	INSTALLATIONS
	E. H. Schaefer (EU) Wisconsin Electric Power Co.	
Third	Robert Smith, Jr. (EC) Philadelphia, Pa.	H. B. Robinson Auto Sales Philadelphia, Pa.
Honorable Mention	Victor P. Sarin (EC) Sarin Electric Co. James F. Finn (EU) Detroit Edison Company	Stark Hickey Detroit, Mich.
Honorable Mention	Richard Haag (EC) Haag Electric Co. William C. Wilson (EU) N. Y. State Elec. Corp.	Home Dairy Cafeteria Geneva, N. Y.
Honorable Mention	Walter J. Bovay (EC) Bovay Electric Co. Foxboro, Mass.	Brewster's Sherborn, Mass.
Third	J. J. Compernolle (EC) Kelso-Burnett Electric Co.	Youngberg Carlson Co. Chicago, Ill.
Third	Harry M. Farber (EC) Harry M. Farber & Bros. G. Earle Watt (EU) Philadelphia Electric Co.	Raymond Rosen Co. (Tele-Dynamics, Inc.) Philadelphia, Pa.
Honorable Mention	William Black (EC) Power Electrical Co., Inc. Wakefield, Mass.	Mystic Valley Gas Co. Malden, Mass.
Honorable Mention	Ray O. Sims (EC) Trowbridge Electric Co.	622 SE Jackson Street (Offices) Roseberg, Ore.
Third	Walter R. Guldi (EC) A. Guldi & Sons Westhampton Beach, N. Y. Leonard Sheldon (D) Riverhead, N. Y.	Wildwood Lanes Riverhead, N. Y.
Third	J. D. Brown (EC) Patterson, Emerson & Comstock	University of Pittsburgh Library Pittsburgh, Pa.
Third	A. E. Shulzinsky (EC) Olson Electric & Hardware Co.	Heintzelman Motors (Used Car Lot) Daytona Beach, Fla.
Third	J. O. LeGate (EC) Anchor Metals, Inc.	Anchor Metals (Sign) Hurst, Texas
Third	William Fosnocht (EC) Wm. Fosnocht & Son Arthur V. Schafer (EU) Philadelphia Electric Co.	Pottstown School (Football Field) Pottstown, Pa.

EC —Electrical Contractor
EW —Electrical Wholesaler
CE —Consulting Engineer
E —Plant Engineer
A —Architect
D —Designer
EU —Electric Utility

GROUP A PANEL judged the industrial and commercial entries. Panel consisted of (l. to r.): Russell C. Putnam, C. M. Cuttler, and Carl W. Zersen, Chairman. There were 181 entries in this group.

Prize Winners in ARCHITECT-ENGINEER DIVISION

PRIZES	CONTESTANTS	INSTALLATIONS
INDUSTRIAL LIGHTING		
1	Herbert S. Glick (E) Eastman Kodak Co.	Eastman Kodak Co. Sunlight Test Cabinet Rochester, N. Y.
Second	Harry Terry (CE) Trenton, N. J.	U. S. Bronze Power Works Inc., Flemington, N. J.
STORE LIGHTING		
First	S. J. Brochstein Brochstein's Inc. Houston, Texas H. G. Hrivnatz (EU) Houston Light & Power Co.	Goldring's, First Floor New Orleans, La.
Second	J. Gordon Carr (A) J. Cordon Carr & Associates	Texaco Touring Center New York, N. Y.
Third	S. J. Brochstein (D) Brochstein's Inc. Houston, Texas H. G. Hrivnatz (EU) Houston Light & Power Co.	Lichtenstein's Corpus Christi, Texas
Third	James F. Angier (CE) Washington, D. C. James M. Inman (E) Lansburgh's Dept. Store	Lansburgh's Dept. Store Main Floor Washington, D. C.
Third	E. D. Wilder, Jr. (CE) Ashland, Mass. John M. Blomgren (EC) The Eastern Electric Co. Cochituate, Mass.	Romeo's Supermarket Ashland, Mass.
OFFICE LIGHTING		
First	R. W. Dyer (A) E. H. Schaefer (EU) Wisconsin Electric Power Co.	Mutual Savings & Loan Association Milwaukee, Wisc.
Second	A. O. Willauer (A) New England Mutual Life Ins. Co.	New England MutualLife Ins. Co. Boston, Mass.
Third	J. Gordon Carr (A) J. Gordon Carr & Associates	Socony Mobil Oil Co. (Board Room) New York, N. Y.
Third	Edward B. Page (A) Clyde E. Bentley (CE)	Fireman's Fund Insurance Co. San Francisco, Calif.
INSTITUTIONAL LIGHTING		
First	Lawrence T. Genise (CE) Giffels & Vallet, Inc. Detroit, Mich.	University of Michigan Exhibition Pool Ann Arbor, Mich.
Second	Dana D. Carrough (A) Stockton, Calif.	Lincoln High School Stockton, Calif.
Third	Albert C. Koegel (CE) Hedrick, Stanley & Morey Dallas, Texas	Senior High School (Addition) Irving, Texas
Third	E. J. Polasek (CE) Eau Claire, Wisc.	Second Congregational Church Eau Claire, Wisc.
Third	Charles F. Howe (CE) Atlanta, Ga.	W. A. Alexander Memorial Coliseum, Atlanta, Ga.
OUTDOOR LIGHTING		
First	J. M. Kyle (CE) Engineering Department Port of New York Authority T. M. Sullivan (E) Aviation Planning Division Port of New York Authority	New York International Airport Jamaica, N. Y.
Second	Scott Beamer (CE) Oakland, Calif.	Hassler Memorial Fountain Oakland, Calif.
Third	C. Daniel Weyman (CE) A. E. D'Ambly	Robin Hood Dell (Bandstand Shell) Philadelphia, Pa.

PRIZES	CONTESTANTS	INSTALLATIONS
	O. Kline Fulmer (A) Fulmer & Bowers Princeton, N. J.	
Third	William S. Watkins (CE)	Reighart Steel Products Corp., Willoughby, Ohio
Honorable Mention	Paul Scherr (A) Philadelphia, Pa. George T. Anderson, Jr. (EU) Philadelphia Electric Co.	George L. Eakle (Hat Shop)† Philadelphia, Pa.
Honorable Mention	Albert C. Koegel (CE) Hedrick, Stanley & Morey	Vicks Continental Restaurant Dallas, Texas
Honorable Mention	Sol Flax (CE)	Dahlia Lanes Denver, Colo.
Honorable Mention	S. J. Brochstein (D)	Biff's Lake Charles, La.
	Brochstein's Inc. Houston, Texas H. G. Hrivnatz (EU) Houston Light & Power Co.	
Honorable Mention	S. J. Brochstein (D) Brochstein's Inc. H. G. Hrivnatz (EH) Houston Light & Power Co.	Sakowitz Bros. (Gift Dept.) Gulfgate Center Houston, Texas
Honorable Mention	S. J. Brochstein (D) Brochstein's Inc. H. G. Hrivnatz (EU) Houston Light & Power Co.	Sakowitz Bros. (First Floor) Gulfgate Center Houston, Texas
Third	Bertil Fasth (A) Fasth, Hillstrom & Horty, Inc. George Ellison (CE) Eriksen, Ellison & Assoc., Inc.	Minneapolis City Hall—Court House City Council Chambers Minneapolis, Minn.
Honorable Mention	Arthur D. Probst (E) DeLaval Steam Turbine Co. Karl W. Rembe (EW) Griffith Electric Supply Co.	DeLaval Steam Turbine Co. (Drafting Room) Trenton, N. J.
Honorable Mention	John C. Staff, Jr. (CE) Staff Electric Company Milwaukee, Wisc. E. H. Schaefer (EU) Wisconsin Electric Power Co.	Christ King Congregation Wauwatosa, Wisc.
Honorable Mention	Dr. J. Pawlikowski (CE) City of Montreal	La Fonbeine Park Theatre Montreal, P. Q., Canada
Honorable Mention	Louis R. Lundgren (CE) Haarstick, Lundgren & Associates	Como Park Jr. High school St. Paul, Minn.
Honorable Mention	Byron H. Becker (A) Wheeler & Becker	Michigan Bank Detroit, Mich.
Third	Arthur A. Gorrell, Jr. (CE) Brittelle, Ginner, Decker & Assoc.	Motel Stevens Carlsbad, New Mexico
Third	Henry P. Rouquette (CE) Palmer & Baker, Inc. Mobile, Ala.	Greater New Orleans Expressway Airline Highway Interchange New Orleans, La.
Honorable Mention	John C. Staff, Jr. (CE) Staff Electric Co. Milwaukee, Wisc. E. H. Schaefer (EU) Wisconsin Electric Power Co.	Christ King Congregation Wauwatosa, Wisc.

PRIZES	CONTESTANTS	INSTALLATIONS	PRIZES	CONTESTANTS	INSTALLATIONS
RESIDENTIAL LIGHTING					
First	Melvin Cohen (CE) A. Epstein and Sons, Inc. Chicago, Ill.	Kitchen Lighting Integrated With Architectural Design	Third	Lawrence H. Ayer (A) Bartlett & Ayer, Architects Oakland, Calif.	Wayne W. Wentner Residence Walnut Creek, Calif.
Second	J. Gordon Carr (A) J. Gordon Carr & Associates	Private Residence Greenwich Conn.	Third	G. Verdam (CE) Raadg. Techn-Bur.	G. Verdam Residence Vlaardingen, Holland

Prize Winners in ELECTRICAL DISTRIBUTOR DIVISION

INDUSTRIAL LIGHTING					
First	Fred G. Kirchobel (EW) San Francisco Lighting & Supply Co.	Lenkurt Electric San Carlos, Calif.		F. J. Ryan (E) Australian Paper Manufacturers	
Second	Max E. Wilson (EW) Consolidated Lighting Pty. Ltd.	Australian Paper Manufacturers Brisbane, Queensland	Third	Chris Borkholm (EW) Graybar Electric Co., Inc. Dallas, Texas	Olive, Myers, Spalti Furniture Co. Athens, Texas
STORE LIGHTING					
First	L. E. Mirus (EW) Efengee Electrical Supply Co., Inc.	Barber and Beauty Shop Hotel Sherman, Chicago, Ill.		J. W. Bush (A) Spicer-Bush-Witt, Architects	
			Third	William Huyck (EW) Westinghouse Electric Supply Co.	Supermarket Des Moines, Iowa
Second	Harold Danchik (EW) Rogers Electric Supply Co.	Lee Optical Co. Dallas, Texas			
Third	Edwin Schnoll (EW) Standard Electric Supply Co. Everett H. Schaefer (EU) Wisconsin Electric Power Co.	The Grand East Milwaukee, Wis.	Honorable Mention	B. R. Bunn (EW) Westinghouse Electric Supply Co. John A. Schneider (EC) Langstadt's Inc.	Park-N-Market Appleton, Wisc.
Third	L. U. Marshall (EW) General Electric Supply Co.	R. E. Cox Company Waco, Texas	Honorable Mention	Gil Stadeker (EW) Triangle Electric Co.	Carl Schletz Foods Chicago, Ill.
OFFICE LIGHTING					
First	Victor L. Kochajda (EW) Frank C. Teal Electric Co.	Cross Company Detroit, Mich.	Third	Ralph T. Franco (EW) General Electric Supply Co.	Bache & Co. New York, N. Y.
Second	Bernard E. Weigel (EW) W. A. Roosevelt Co.	LaCrosse Rubber Mills Co. LaCrosse, Wisc.	Third	Laurence F. Chase (EW) Twin State Electrical Supply Co.	Inter-State Trust Co. White River Jct., Vt.
Third	Frank J. Dennehy (EW) George H. Wahn Co.	John C. Paige Co. Boston, Mass.			
INSTITUTIONAL LIGHTING					
First	Normal Pattee (EW) W. T. Foley Electric Co. Kansas City, Kansas	First Methodist Church Emporia, Kansas	Second	Dan Jones (EW) Richards Electric Co. Dr. Joseph J. Peters (E) Xavier University	Xavier University, Dept. of Biology, Cincinnati, Ohio
OUTDOOR LIGHTING					
First	Howard J. McCullough (EW) Westinghouse Electric Supply Co.	Northfield Park (Racetrack) Northfield, Ohio	Third	Hammond Gelman (EW) Downtown Light & Fixture Co. Philadelphia, Pa. Albert Weiner (E) C & D Batteries Inc. Arthur v. Schafer (EU) Philadelphia Electric Co.	C&D Batteries Inc. Conshohocken, Pa.
Second	K. E. Taylor (EW) Westinghouse Electric Supply Co.	Scotty (Miniature) Golf Amarillo, Texas			
Third	William Huyck (EW) Westinghouse Electric Supply Co.	Supermarket Des Moines, Iowa			

GROUP B PANEL judged the 38 entries in the outdoor lighting classification. Judges were (l. to r.): C. L. Crouch, Chairman, Everett M. Strong, and Charles H. Goddard.

GROUP C PANEL judged the 25 entries in the residential lighting classification. Judges were (l. to r.): Edw. A. Campbell, Myrtle Fahsbender, Chairman, and W. F. Little.

PRIZES	CONTESTANTS	INSTALLATIONS	PRIZES	CONTESTANTS	INSTALLATIONS
RESIDENTIAL LIGHTING					
First	Mrs. Edna P. Fortier (EW) Electrical Supply Co.	A Penthouse In the Clouds Pontchartrain Hotel New Orleans, La.	Third	Albert Schramm Torres (EW) Coast Electric Co. San Diego, Calif.	Mrs. Rodriguez Residence Tijuana, B. C., Mexico
Second	Carl R. Butterfield (EW) Butterfield Electric Co. Harry DePoy (EU) Iowa Electric Light & Power	Carl R. Butterfield Residence Cedar Rapids, Iowa	Third	Daniel W. Greenfield (EW) Reliable Electric Supply Co. Newark, N. J.	Recreation Room, 24 Blackston Drive Livingston, N. J.

Prize Winners in ELECTRIC UTILITY DIVISION

INDUSTRIAL LIGHTING					
First	William C. Hoch, Jr. (EU) Philadelphia Electric Co.	Soabar Mfg. Co. Philadelphia, Pa.	Third	James F. Williams (EU) Dayton Power & Light Co.	Dayton Power & Light Co. Garage Repair Shop
Second	Roger W. Renkel (EU) Union Electric Co.	Maloney Electric Co. St. Louis, Mo.	Third	Stanley W. Purdum (EU) Philadelphia Electric Co.	Robert Swanson Kennett Square, Pa.
Third	Paul E. Kimball (EU) Indianapolis Power & Light	C. E. Pauley Printing Co. Indianapolis, Ind.	Honorable Mention	Delwin N. Schneider (EU) Central Illinois Light Co.	The Hyster Co. Peoria, Ill.
STORE LIGHTING					
First	Robert J. Huff (EU) San Diego Gas & Electric Co.	Ballantyne Buick El Cajon, Calif.	Honorable Mention	Leroy J. Widigen (EU) Iowa-Illinois Gas & Electric Co.	M. L. Parker Co. Davenport, Iowa
Second	James Q. Miller (EU) Consumers Power Company	Consumers Power Co. Muskegon, Mich.	Honorable Mention	Leroy J. Widigen (EU) Iowa-Illinois Gas & Electric Co.	Phillips Plumbing and Heating Co. Davenport, Iowa
Third	Ervin J. Cook (EU) St. Joseph Light & Power Co.	Davis One-Stop Shopping Center, St. Joseph, Mo.	Honorable Mention	Norman L. Osberg (EU) Worcester County Electric Co.	Anthony's Package Store Gardner, Mass.
Third	John R. Gale (EU) Dayton Power & Light Co.	Ed Cornell's (Men's Store) Greenville, Ohio			
Third	Stanley W. Purdum (EU) Philadelphia Electric Co.	Leon's Jewelry Store Coatesville, Pa.			
OFFICE LIGHTING					
First	Everett H. Schaefer (EU) Wisconsin Electric Power Co. Henry Koether (EU) Wisconsin Electric Power Co.	First Wisconsin National Bank Milwaukee, Wis.	Honorable Mention	George C. Linthicum (EU) Philadelphia Electric Co.	Farmers and Mechanics National Bank Phoenixville, Pa.
Second	John F. Dougherty (EU) Hartford Electric Light Co.	Connecticut Valley Power Exchange	Honorable Mention	Carman D. Miller (EU) Duquesne Light Co. M. C. Gilchrist (EU) Duquesne Light Co.	Duquesne Light Co. System Operator's Office Pittsburgh, Pa.
Third	George A. Waters (EU) Quebec Power Co.	Pierre Rinfret, DBA Sillery, Quebec (Canada)	Honorable Mention	Harold I. Strahn (EU) Dept. of Water & Power, City of Los Angeles	Around the Clock Telephone Exchange Van Nuys, Calif.
Third	James F. Williams (EU) Dayton Power & Light Co.	Dayton Power & Light Co. (Executive Offices)			
Third	Hubert A. Fougere (EU) Central Maine Power Co.	Federal Loan & Bldg. Assn. Portland, Maine	Honorable Mention	H. Mayhew White (EU) Baltimore Gas & Electric Co.	Weaver Bros. Baltimore, Md.
INSTITUTIONAL LIGHTING					
First	Alfred C. Sangster (EU) The Detroit Edison Co.	Bon Secours Hospital Chapel Grosse Point, Mich.	Third	Mathew Veeck (EU) Consolidated Edison Co. of N. Y., Inc.	U. S. Custom House New York, N. Y.
Second	Alfred C. Sangster (EU) The Detroit Edison Co.	St. Raymond Church Detroit, Mich.			
Third	James Q. Miller (EU) Consumers Power Co.	St. Paul's Episcopal Church Muskegon, Mich.	Honorable Mention	Russell W. Benjamin (EU) The United Illuminating Co. Joseph F. Barney (EW) General Electric Supply Co.	The Stratford Public Library Stratford, Conn.
Third	Jim H. Koen (EU) Georgia Power Co.	Peachtree Christian Church Atlanta, Ga.			
OUTDOOR LIGHTING					
First	Donald L. Roberts (EU) Arizona Public Service Co.	Hotel Valley Ho Scottsdale, Ariz.	Third	Ralph D. Andrew (EU) Pennsylvania Power & Light Co.	Colonial Motor Lodge Denver, Pa.
Second	Leon R. Case, Jr. (EU) Savannah Electric & Power Co.	Independent Presbyterian Church Savannah, Ga.			
Third	George A. Watters (EU) Quebec Power Co.	Champlain Monument Quebec, Que. (Canada)	Third	James F. Williams (EU) Dayton Power & Light Co.	Dayton Power & Light Co. Loading Dock
RESIDENTIAL LIGHTING					
First	Richard C. Medcalf (EU) Duke Power Co.	Five Star Electric Home Hickory, N. C.	Third	Mrs. Irene S. Covington (EU) Mississippi Power & Light Co. Jackson, Miss.	L. A. Peterson Residence Jackson, Miss.
Second	Mary E. Taepke (EU) The Detroit Edison Co.	Apartment in Cooperative Building Detroit, Mich.			
Third	Charles F. Kramsvogel (EU) Consumers Power Co.	R. H. Fredberg Residence Cheboygan, Mich.	Third	Catherine K. Shank (EU) Dayton Power & Light Co	Mrs. O. B. Powell Residence Brookville, Ohio

Board of Governors of the National Electrical Contractors Association met November 11 and 12.

CONTRACTORS IN CINCINNATI

George Andrae, Herman Andrae Electrical Co., Milwaukee, receives the Coggeshall Award from O. F. Burnett, President of NECA.

Convention personalities at the annual meetings and electrical trade exposition of the National Electrical Contractors Association held in Cincinnati's Music Hall, November 11-16. For the convention report see page 183.

J. E. Pipher, Jay's Electric Service & Supply, Oklahoma City, Okla.; Ted Lloyd, Almond Electric Co., Oklahoma City, Okla.; F. C. Kitchen, Almond Electric Co., Inc., Harrisburg, Pa.; Weldon White, Almond Electric Co., Inc., Harrisburg, Pa.; E. F. Sulzer, E. Fred Sulzer & Co., Cranford, N. J.; James McKinnes, Watson-Flagg Engineering Co., Paterson, N. J.; R. B. Berger, B-B Electrical Contractors, Inc., Paterson, N. J.; Charles Patterson, Buhl & Caffrey, Inc., Newark, N. J.; P. J. Quinn, NECA Chapter Manager, Newark, N. J.; A. L. Davis, A. L. Davis Co., Newark, N. J.; H. E. O'Neill, H. E. O'Neill Co., Jersey City, N. J.; E. E. Leasure, Monroe Electric Co., Chicago; Humphrey Gibson, Gibson Electric Co., Chicago; C. P. Walters, Jr., Fries-Walters Co., Chicago; and W. J. Howe, J. Livingston & Co., Chicago.

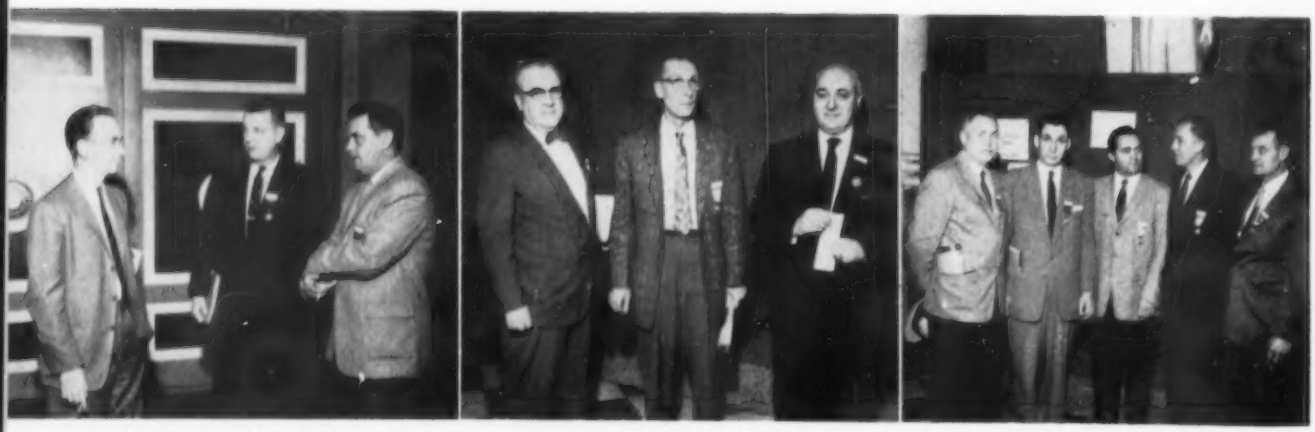
W. G. Hoffman and E. W. McCall, Tennessee Armature & Electric Co., Knoxville, Tenn.; J. G. Ness, Eckardt-Ness Electric Co., Atlanta, Ga.; R. E. Fisher, North Central Ohio Chapter, NECA, Akron, Ohio; Adolph Fremder, Fremder Electric Co., St. Louis, Mo., Paul Nolte, Local No. 1, IBEW, St. Louis, Mo.; M. A. Patterson, Patterson Electric Co., Akron, Ohio; W. L. McAdams, McAdams Electric Co., Cuyahoga Falls, Ohio; Joseph Lorenz, Central Queens Electric Supply Corp., Jamica, N. Y.; A. G. Hillebrand, Hillebrand & Owen, Inc., Syracuse, N. Y., and J. M. Doster, Doster and Egan, Syracuse, N. Y.

R. C. Spaulding, Spaulding Electric Co.; Daniel Diamond, Local 58, IBEW; Harry Hauschild, Hatzel & Buehler, Inc., J. W. Albright Triangle Electric Co. all of Detroit; H. A. Webster, T. Frederick Jackson, Inc., Long Island City, N. Y.; S. W. Hurowitz, Consolidated Electric Construction Co., Inc., E. A. Kahn, E. A. Kahn & Co., Inc., New York; J. W. Frommer, L. K. Comstock & Co., Inc., New York; H. J. Vorzimer, Federal Pacific Electric Co., Long Island City, N. Y.; R. R. Wray, H. B. Wray and J. W. Wray, Wray Electric Contracting, Inc., Cincinnati; and J. W. Bronaugh, Bronaugh Equipment Co., Cincinnati.

D. T. Gorrell, Gorrell Electric, Parkersburg, W. Va.; L. P. Harvey, Schoolfield-Harvey Electric Co., Charleston, W. Va.; G. R. Ball, Ball Electric Co., Belpre, Ohio; R. E. Klimas, Klimas Electric Co., Wheeling, W. Va.; R. C. Hughes, R. C. Hughes Co., Spokane, Wash.; C. W. Moseley, R. H. Bouligny, Inc., Charlotte, N. C., G. B. Schetky, Western Electrical Construction Co., Portland, Ore.; R. L. Sargent, Power Line Erectors, Inc., Spokane, Wash.; F. C. Smiley, National Electrical Construction Co., Kansas City, Mo.; B. L. Slater, Slater Electric Co., Folsom, Calif.; and F. N. Redman, Deacy-Redman Electric Co., Kansas City, Mo.

F. G. Astor and F. C. Astor, Astor Electric Service, Inc., Miami Beach, Fla.; E. H. Seaton, Seaton Electric Co., Miami, Fla.; J. E. Collier, Collier Electric Co., Denver, Colo.; E. C. Armstrong, Wazee Electric Co., Denver; L. J. Reynolds, Jr., Reynolds Electric & Engineering Co., Las Vegas, Nev., Neil Weiss, Ascher Corp., Newark, N. J.; William Flowers, Abilene Service Co., Abilene, Texas; R. W. McChesney, Harry Alexander, Inc., Washington, D. C.; D. B. Clayton, Electric Constructor, Inc., Birmingham, Ala.; A. Herrmann Wilson, Electrical Construction Co., Washington, D. C.; and Harry W. Kellams, Chapter Manager, NECA, Washington, D. C.

W. L. O'Connell, John W. Breslin Co., Chicago; W. P. Hogan, Jr., Chief Electrical Inspector, Chicago; Jack Braverman, Gerson Electric Construction Co., Chicago; J. F. Block, Block Electric Co., Inc., Chicago; S. M. Kahn, S. M. Kahn, Inc., Chicago; Sidney Rogers, Rogers Electrical Prefab, Toledo; Neil Crowley, Ohio Pipe Trades, Toledo; Orson Taylor, Taylor Electric Co., Inc., Toledo; R. W. Colgan, Rogers Electrical Prefab, Toledo; Philip Taylor, Taylor Electric Co., Inc., Toledo; W. C. Schlosser, Capital Electric Co., Madison, Wis.; William Plummer, H & H Electric, Madison; R. W. Hainstock, O. T. Havey Electric, Madison; and E. R. Stege, Chapter Manager, NECA, Madison.



R. F. Yeager, L & W Electric Co., Rock Island, Ill.; R. F. Heysinger, Davenport Electric Contract Co., Davenport, Iowa; J. V. Russell, Russell Electric, Inc., Bettendorf, Iowa; W. D. Walker, Manager, Penn-Del-Jersey Chapter, NECA, Philadelphia; Ralph Daubert, Daubert Electric Co., Reading, Pa.; Samuel Skolnick, Samuel Skolnick Co., Springfield, Mass.; A. D. Smith, A. F. Smith & Son, Inc., Ypsilanti, Mich.; Myer Weinstein, Weinstein Electric, Co., Flint, Mich.; John Krason, United Electric Co., Inc., Flint; Warren Anderson, Anderson Electric Co., Flint; and Wilfred Dennis, Universal Electric Co., Flint.

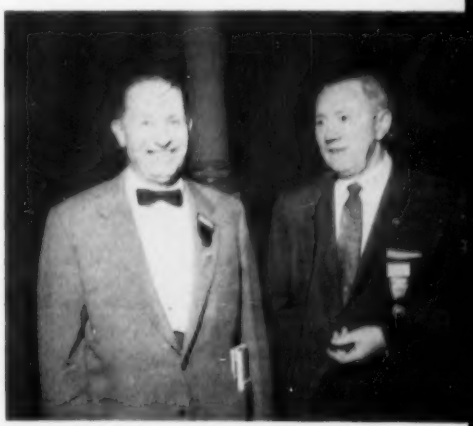
G. J. Connor, Stearns, Perry & Smith Co., Boston, Mass.; Al Frank, Eastern Electric Co., Boston; Robert McKenzie, McKenzie Electric Co., Chattanooga, Tenn.; and Herbert Haile, W. C. Teas Co., Chattanooga.

W. G. Hoffman, Tennessee Armature & Electric Co., Knoxville, Tenn.; and J. C. Bolen, Electrical Contracting & Engineering Co., Charlotte, N. C.

H. R. Bryars, Economy Electric Construction Co., Mobile, Ala.; J. T. Martin, Martin Electric Co., Jackson, Miss.; Z. J. Pratt, Pratt Electric Co., Birmingham, Ala., D. W. Traylor, Traylor Electric Co., Birmingham, Ala.

E. C. Carter, Carter Electric Construction Co., Pittsburgh, Pa.; Phil Stinchcomb, Phillip Stinchcomb, Inc., Baltimore, Md.

Maurice Johnson, Johnson Electric Co., Spokane, Wash., William Frost, Frost Electric Co., Spokane, Wash.; Orlando Diefenderfer, Orlando Diefenderfer Electric Construction Co., Allentown, Pa.; and A. C. Faust, Henkels and McCoy, Philadelphia.



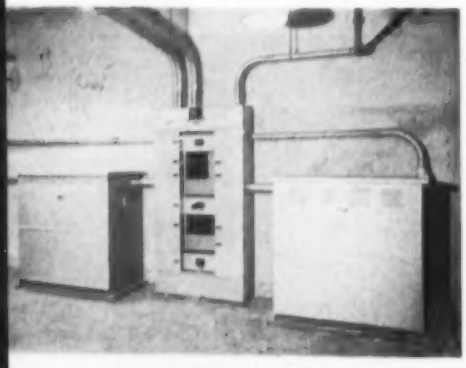
Burt Hurd, B-H Electric Co., Chicago; and Wm. Fecht, Fecht Electric, Inc., Chicago, Ill.

NEW SERVICE FOR POWER requirements involved installation of 1600-amp, 480-volt, 3-phase switchgear assembly equipped with stubbed-up buses into overhead pullbox, and with primary lugs to receive utility cables horizontally.

Quarter-century-old Los Angeles building receives future-insuring . . .

NEW LEASE ON LIFE

. . . when comprehensive modernization plan includes installation of new primary power facilities, practical distribution mediums, high-quality lighting and wide range of tenant-satisfying services.



TWIN TRANSFORMERS, separately served from main power switchboard, step current from 480- to 240-volt for operation of tabulating equipment in the building. Split-bus distribution panel between the two transformers is equipped with 600-amp main disconnects (at top and bottom) and non-automatic tie breaker which is interlocked to prevent its closing unless one of the disconnects is open.

NEW SWITCHGEAR FOR LIGHTING requirements consists of three sections, each containing 1000-amp bus, separate main breaker and 240/120-volt, 3-wire SN primary feeder. Assembly, measuring approximately 16 by 8 by 2 ft, was completely installed before original board was disconnected and dismantled; permitting cutover without service interruption.

WILSHIRE Boulevard in Los Angeles is the distinguished address for dozens of ultra-modern office buildings, so it is surprising to discover that one of the smartest-looking exteriors encloses a quarter-century-old completely-modernized structure that had its beginning in the early '30s, when it was constructed as a showroom-garage for the sale and service of such legendary yesteryear cars as Cords, Dusenbergs and Auburns. As such, it boasted a 30-ft-high ground-floor ceiling, large display windows, massive structural walls, ramps between all floors, an ornate facade—and a practically negligible electrical system.

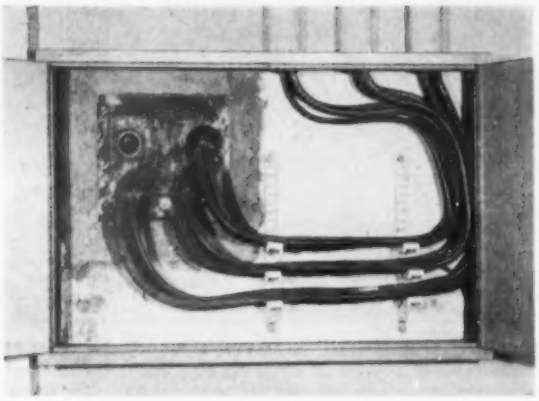
Today these distinguishing characteristics have been drastically revamped, for original walls and floors have been either resurfaced, replaced or removed; car ramps have been eliminated; many doors and windows have been relocated; suspended ceilings conceal numerous structural eyesores, and a new exterior combines architectural beauty with practical functionalism to reflect progressive design features that prevail within.

The modernization program, however, is most-effectively emphasized by the many changes and additions which have affected the utility, rather than the structural, features of the building, for tenants are now served by passenger and freight elevators; central heating, ventilation and air conditioning systems have been added; advanced lighting and acoustical techniques are in consistent evidence, and the electrical system has undergone voltage changes, capacity increases, feeder revisions, plus the addition of both trolley- and underfloor-duct systems.

These utility improvements necessitated still more structural work, for original planning had neither contemplated, nor had it included room for, heating, ventilation and air-conditioning equipment and ducts. Therefore considerable equipment, such as boilers, compressors and cooling towers, had to be relegated to the building's roof, which then had to be resupported by additional structural columns, beams and reinforcing members.

The creation of elevator shafts likewise necessitated cutting through original floor slabs, while the shifting and augmentation of basement-based electrical equipment called for the piercing of bearing walls and the construction of a new switchgear vault.

This modernization program was actually a 2-step affair; the first (minor) step occurring when minimum alterations were effected in order to attract a few commercial tenants to the building, and the second (major) stride occurring when one of the tenants, Richfield



SERVICE PULLBOX for lighting service is liberally-sized enclosure with bi-parting hinged doors permitting freedom for pulling and racking cables. Spare (capped) duct from utility vault outside building provides spare capacity possibilities for normal load growth.

NEW EXTENSION TO EXISTING PULLBOX was added to facilitate connection of existing feeders with new sub-switchboard, while new barriers were installed as required to segregate phased power cables. This arrangement permitted re-use of considerable previously installed wire and conduit.

Oil Corp., purchased the entire property as the home office for their southern division and decided to centralize all 240-volt IBM equipment here to handle all west-coast payroll and customer-billing details. This decision, by itself, contributed materially to the electrical plan, since the IBM machines were both numerous and varied (computers, calculators, sorters, etc.) while many of them were rated up to 50 amps in demand. This fact not only boosted electrical capacity and distribution requirements, but it also magnified the problem of heat dissipation and led to necessary provisions for year-'round air conditioning.

To plan this extensive modernization program, the firm of Albert C. Martin and Associates, Architects and Engineers, was commissioned, with Ken Higuera, their E.E., in charge of the overall electrical design. Actual installation and revision of electrical features was performed by the Newbery Electric Corp., contractors-engineers, with John Engert as supervisor and with Fred Evans as their foreman on the job. In execution, the program was a progressive 2-year floor-by-floor affair, with "business as usual" proceeding in some sections of the building at all times, and with personnel and business equipment being shifted as old leases expired and as new work progressed.

Initial electrical decisions concerned primary service facilities, for both power and lighting capacities were inadequate. Repeated overloads and poor contacts were damaging switchgear; replacement parts for old main breakers were obsolete and had to be hand-made when required. Power interruptions and lengthy shut-downs were frequent; fusible feeder switches were constantly "popping" due to excessive heat within the board. No 480-volt service was available for heavy-duty equipment, and metering arrangements were unsatisfactory for single-occupancy utilization.

In planning for the required new primary service facilities, two alternatives were considered: either to retain the then-existing 3-feeder (1000-amps each) 240/120-volt, 3-wire SN utility service (two feeders to be used for lighting and one for power), or to install an additional 480-volt 3-phase service for power and to use all three existing 240/120-volt feeders for lighting.

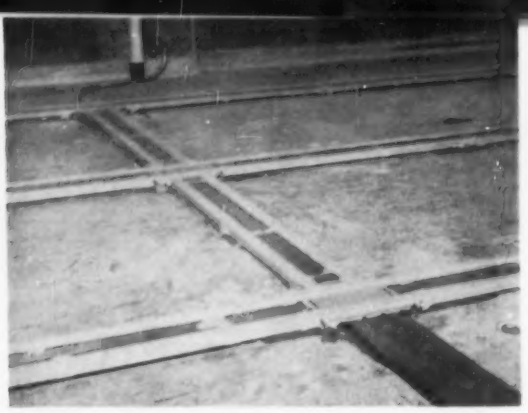
Advantages of the first plan would have permitted re-use of existing service conduit and would have made it unnecessary to install a transforming substation within the confines of the building. Disadvantages, however, would have included the loading of main service feeders to maximum capacity, allowing nothing in reserve for additions due to load growth. It would have overloaded upper-floor risers, necessitating new feeders for air conditioning equipment, and it would have involved the less-efficient and more-costly operation of this air conditioning equipment at 240 rather than at 480 volts.

Advantages related to the second consideration included the provision of adequate spare capacity for future potential expansion; the reduction of primary power copper and conduit requirements; the permissible use of more-economical switchgear and wiring for air conditioning equipment; and the doubling of power riser capacities within the building due to the higher distribution voltage.

The second alternative was the one adopted, so that now separate power and lighting switchboards are served individually, the lighting switchboard having three sections, each with a separate 1000-amp bus structure, 240/120-volt service and a manual circuit breaker fused for 800 amps, and the power switchboard obtaining 480-volt, 3-phase, delta service through a single 1600-amp, 3-pole ACB. Both service entrances are provided with one spare duct connection from a utility company vault located just outside the building, beneath the sidewalk, so that both primary services can be increased in capacities if future load requirements so dictate.

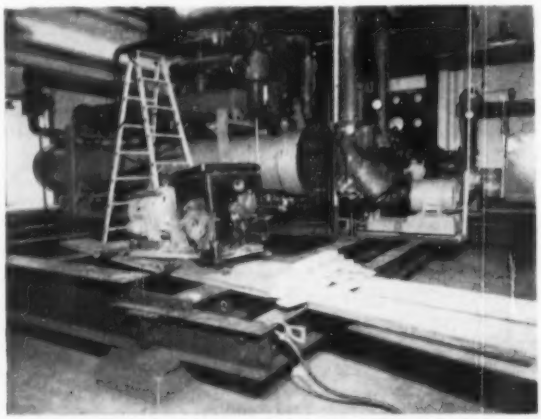
Two feeders from the power switchboard serve twin 150-kva dry-type, 480/240-volt, delta-delta adjacently located transformers in the main switchgear room, secondaries from these two transformers then feeding a common split-bus power panel that, in turn, provides 240-volt service for upper-floor tabulating equipment. This power panel is equipped with 600-amp 3-pole non-automatic main disconnects and an interlocking tie

FLUSH-TYPE UNDERFLOOR DUCTS were installed by chipping and channelling existing floorslabs where necessary, then levelling and aligning components by means of bolts inserted into rawl plugs. Ducts were welded together by manufacturer prior to delivery, thereby simplifying installation while insuring exact match of top elevations.



NARROW WOODEN RUNNERS were taped to outer edges of ducts prior to pouring of finishing concrete, then removed after new concrete surface had hardened, shrunk (in the center areas) and "dished" slightly upwards along the junction lines. These remaining lips were then ground down to establish absolutely smooth sub-base for finishing vinyl covering.

SUSPENDED CEILING in first-floor tabulating room incorporates basic framework of formed-steel inverted-T members on 4-ft centers, with lighting fixtures, acoustical tiling, ventilation grills and loud-speaker panels inserted as desired. Flexible connections between fixtures and branch circuit junction boxes permit shifting of components to produce any desired lighting plan and illumination level.



COMPRESSORS, BOILERS and cooling towers related to heating, ventilation and air conditioning systems had to be installed in roof penthouses due to fact that original planning had neither contemplated nor had provided space for this equipment. This location necessitated installation of additional structural columns and beams, and extended the electrical system by increasing feeder and control facilities.

breaker which can be closed only when one of the main disconnects is open.

A third sub-feeder from the main 480-volt 3-phase switchboard serves a third dry-type 480/240-volt delta-delta transformer (related to the operation of elevators and air fans); a fourth feeder extends to a 480-volt 3-phase motor-control center (for refrigeration and pneumatic compressors, hot and cold water pumps, cooling towers and exhaust fans); a fifth feeder connects with a new sub-switchboard in another part of the basement (related to feeders serving power loads that existed in the building prior to the modernization decision); while a sixth feeder is stubbed and capped as a spare.

By installing a new sub-switchboard, on the site of the original power panel, much original wiring and conduit could be re-used, while, in addition, secondary feeder space on the new 480-volt main switchboard could be conserved. Riser wiring likewise included new wiring in existing conduit, and, of course, additional new wiring with new conduit.

In order to carry old risers into this new sub-switchboard panel, an old pull-box, mounted on the basement ceiling beneath a riser shaft, was greatly enlarged by the addition of a right-angle wing, and barriers were installed as required in order to segregate phased power cables.

In this process of installing new primary service to the building, the old switchboard was maintained "hot" until the new vault had been constructed, new switchgear had been installed, and new feeder connections established. Only then was the old board cut out of service and dismantled, so interruptions in service were negligible.

Multiple Distribution Medium

Distribution of power from local floor panels to utilization points is via several different mediums. (1) 3-cell underfloor ducts on 6-ft centers (one cell for 120-volt power, the other two for public- and closed-circuit Richfield telephone service) is used extensively on three upper floors. (2) Rigid conduit is carried through spaces above suspended ceilings, terminating either at junction boxes, related to lighting systems for the floor below, or stubbing upwards to pierce slabs and connect with

outlet boxes in the floor above to serve desks in center-floor areas where channelling for underfloor duct installations would be uneconomical. (3) 3-rail single-phase, center neutral bus, trolley-duct feeders are used to serve key-punch and IBM-machine areas (120-volt for the former; 240-volt for the latter). And (4) flexible conduit connections join overhead junction boxes with lighting fixtures, to provide flexibility for positioning.

In discussing the use of the flush-type 3-cell underfloor ducts, it is pertinent to remember that the upper floors where they are installed were originally sloped slightly to promote satisfactory drainage and, for that reason, the slabs had to be variously chipped and channelled or built up to new desired floor levels. In general, however, metal duct runs were welded together by the manufacturer prior to delivery to the jobsite, and ducts were held in alignment and at desired elevations by bolts secured by fasteners inserted in slab-drilled holes. Then, before finishing concrete surfaces were poured, narrow wooden strips were taped to either side of duct assemblies (see accompanying illustration) to compensate for normal center-area shrinking and edge-area "dishing" of the concrete. After these normal setting characteristics had been established in hardened finished slabs, the wood strips were removed and the slight edge lips that remained were ground down to make smooth subbase for the vinyl floor tiling.

In discussing branch circuit distribution, it is also pertinent to mention that the 3-bus single-phase trolley-duct installation used in this building, with alternate trolleys staggered between the two hot buses to balance the loading of the system, and with locking couplings, fused on the cold side, connecting the IBM machines with pendent drop cords, was the product of several related ideas. This method for providing flexible power distribution has since been adopted by the Los Angeles Department of Water & Power as a standard, recommended procedure. In general, the 50-amp trolley-duct runs are limited to 20 ft in length to insure peak voltage conditions at all take-off points; duct runs are spaced not over 8 ft apart to provide floor-wide coverage; while drop-cords are light in color to minimize background wall-tones.

EXTERIOR ILLUMINATION of modernized building features backlighted trade-mark eagles, adjustable semi-recessed eyeball spotlights to highlight planting arrangements, flush recessed lensed incandescent downlights above entrance thresholds, and translucent lettering (not shown in this photo) in signs carrying name of building owner.

Flexible Lighting Arrangement

In the largest, main floor, area to be so equipped with 50-amp trolley-duct runs, the basic framework for the suspended ceiling consists of inverted-T formed-steel framing members positioned 10 ft above the floor and arranged in parallel on a 4-ft, center-to-center, pattern. This interval between framing members makes it possible to support lighting fixtures (4 by 2 ft) acoustical panels and ventilation grilles (1 by 4 ft) directly while loud-speaker panels (2 by 2 ft) can be included in the ceiling plan by installing additional intermediate bars.

These various elements for lighting, acoustics, sound and air conditioning, rest directly upon flanges of the inverted tees and are kept in alignment with each other through the use of splines. They therefore are easily removable or adjustable, so considerable flexibility is provided for altering the arrangement of ceiling panels and fixtures as desired. This possibility for ceiling-pattern adjustment is also promoted through the use of flexible leads that connect ceiling junction boxes and lighting units, for these leads, two connected to each JB, have sufficient slack to permit the shifting of luminaires along mounting tracks within reasonable limits. This, in turn, permits fixtures to be placed closer together in order to boost illumination levels, where desired, and, since branch circuits were originally loaded in moderation, the circuits would not be overloaded if the number of fixtures were increased.

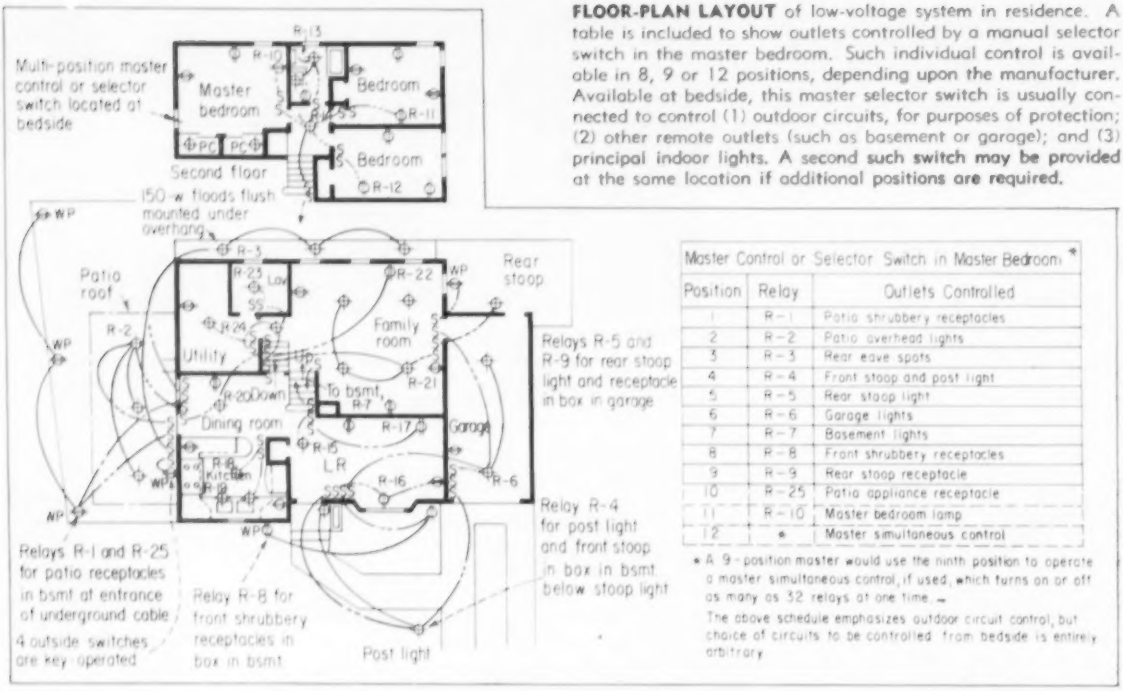
Luminaires in this area, incidentally, are 4-lamp, 48-in. warm-white, fluorescent units equipped with diffusing panels. And as generally spaced on an 8- by 8-ft module layout, they provide an average of 55-footcandles of general illumination to desk tops and machines.

In other office areas of the building, with illumination going up as high as 100-fc, lighting is provided by either 8-ft surface-mounted units having louvered bottoms and translucent side panels, each unit containing four standard-warm-white lamps or, in smaller offices, by semi-recessed glass-enclosed incandescent luminaires housing 150-w lamps.

In public areas such as main and elevator lobbies, single-lamp fluorescent lamps, with ends staggered, are installed in liberally-sized coves to provide indirect illumination, while semi-recessed lensed incandescent downlights are used to raise floor-level lighting-levels and to add tonal warmth to the prevailing motif of natural primavera wall panelling, marbleized baseboards and planting boxes, mottled terrazzo or rubber-tiled flooring, and white ceilings.

The exterior of the building likewise presents lighting variety, for several Richfield name signs incorporate internally-lighted translucent lettering; trade-mark eagles are silhouetted by concealed backlighting; artistic shrubbery and planting arrangements are highlighted by adjustable eye-ball semi-recessed spots; while sidewalk thresholds to all-glass entrance doors are safely lighted by incandescent lensed downlights recessed into an overhanging canopy.

The result of this modernization program merits commendation, for it has renewed the useful life of this quarter-century-old structure, and it has provided the new owners with an electrical system designed to satisfy all normal needs for the foreseeable future.


Multi-position master control or selector switch located at bedside
Master bedroom
Bedroom
Bedroom
Second floor
150-w floods flush mounted under overhang
Patio roof
Rear stoop
Family room
Utility
To bsmt.
Dining room
Garage
Kitchen
LR
Relays R-5 and R-9 for rear stoop light and receptacle in box in garage
Relay R-4 for post light and front stoop in box in bsmt below stoop light
Relays R-1 and R-25 for patio receptacles in bsmt at entrance of underground cable
4 outside switches are key operated
Relay R-8 for front shrubbery receptacles in box in bsmt
Post light

FLOOR-PLAN LAYOUT of low-voltage system in residence. A table is included to show outlets controlled by a manual selector switch in the master bedroom. Such individual control is available in 8, 9 or 12 positions, depending upon the manufacturer. Available at bedside, this master selector switch is usually connected to control (1) outdoor circuits, for purposes of protection; (2) other remote outlets (such as basement or garage); and (3) principal indoor lights. A second such switch may be provided at the same location if additional positions are required.

Master Control or Selector Switch in Master Bedroom *		
Position	Relay	Outlets Controlled
1	R-1	Patio shrubbery receptacles
2	R-2	Patio overhead lights
3	R-3	Rear eave spots
4	R-4	Front stoop and post light
5	R-5	Rear stoop light
6	R-6	Garage lights
7	R-7	Basement lights
8	R-8	Front shrubbery receptacles
9	R-9	Rear stoop receptacle
10	R-25	Patio appliance receptacle
11	R-10	Master bedroom lamp
12	*	Master simultaneous control

* A 9-position master would use the ninth position to operate a master simultaneous control, if used, which turns on or off as many as 32 relays at one time.

The above schedule emphasizes outdoor circuit control, but choice of circuits to be controlled from bedside is entirely arbitrary.

LOW-VOLTAGE SWITCHING

. . . what it is, how it works

A roundup of ratings, characteristics and applications of remote-control systems and components.

CONTROL of branch circuits through the use of Class 2 low-voltage switching has brought new convenience and flexibility to residential wiring—as well as to many commercial and industrial control applications.

The principle is an old one: load switching is accomplished by heavy-duty relay contacts rated for the load to be handled, the relay being energized by a remote switch. But dependable, low-cost components are now being manufactured which are ideal for relatively small loads and less severe operating conditions encountered in homes, offices and many commercial and manufacturing operations.

It makes practical for the first time really adequate switching control of outlets from *any number* of different locations simply by connecting the switches in parallel—without a multiplicity of 3- and 4-way switches and their associated line-voltage wiring. Properly installed, multiple switching provides continuous paths of light through the home from one room to another and eliminates groping in the dark for light switches.

Branch circuit wiring with low-voltage control differs from conventional wiring only in that the line-voltage switch legs from the outlets are replaced by low-voltage conductors (usually No. 18). The relays may be installed in the boxes feeding the outlet to be switched or they may be ganged in one or more central locations.

Key components which make up the low-voltage system, in addition to the interconnecting wire and cable, are (1) a low-voltage power supply, (2) a relay to switch the load, and (3) a switch to control the relay. Switching units are also designed to furnish multi-position or master control of two general types. One provides simultaneous on-off control of all relays connected to it; the other permits individual manual control of each relay and may also permit rapid-sequence operation of all relays.

At present, three essentially different systems exist. The following descriptions, diagrams and photographs show the components, features and wiring connections of each system.

SYSTEM A: CENTRAL POWER SUPPLY, 2-WIRE SWITCHING

Power Source: A single main power source is used to provide dc voltage for operation of all relays in this system. The power supply is composed of a pulse-type transformer, a selenium rectifier, and an electrolytic capacitor. Input voltage is 115 volts; momentary output voltage occurring when a switch is pressed is 24 volts. Closed-circuit voltage on the secondary in the event of a short or stuck switch is 3 volts. This power supply is usually mounted on one of the relay cabinets, but it may be installed at the service entrance if so required by local codes.

Relay: The relay used is a cam-action latching type with a single coil. Successive impulses from the power supply alternately open and close the 115-volt contacts in the load circuit.

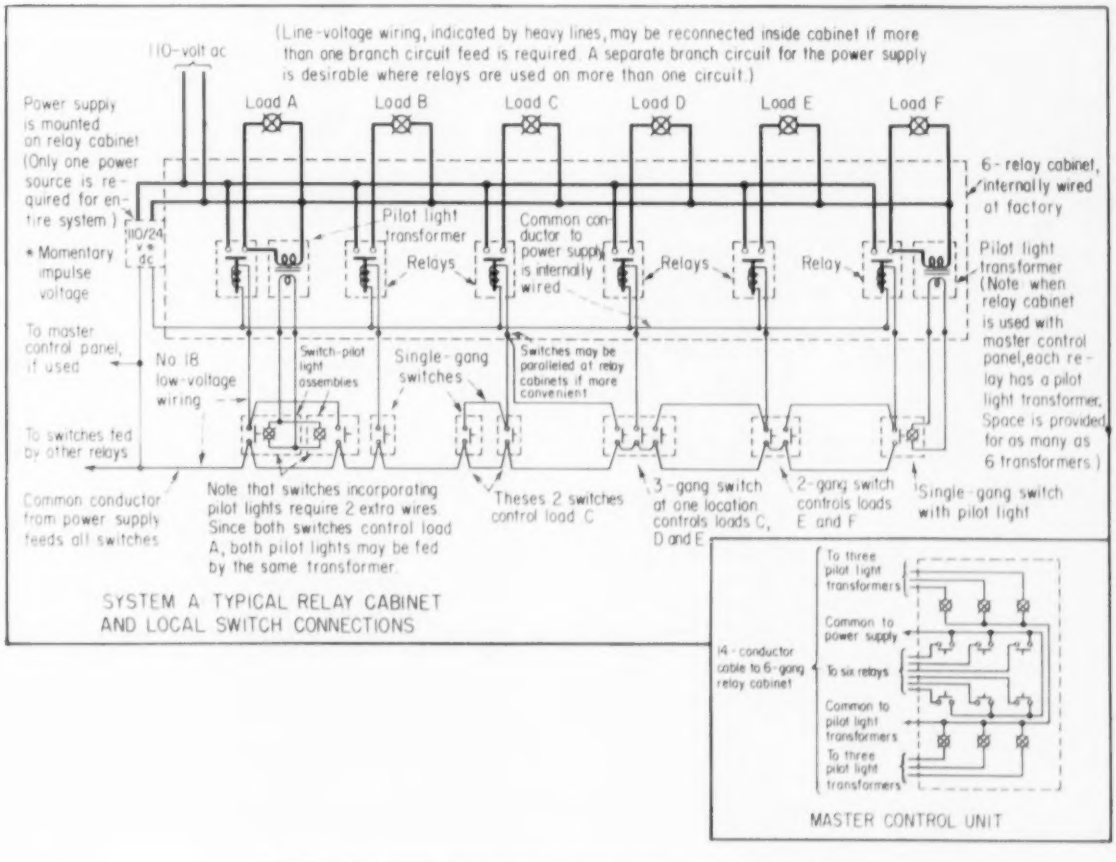
Relays are normally ganged in a cabinet, all cabinets being mounted in a central location. Factory prewired units are available in 6, 10, 12 and 15-gang cabinets, although components may be assembled on the job. Low- and line-voltage wiring is separated in the cabinets by metal barriers. Knockouts provide for one or more 115-volt branch circuit feeds. Each relay may control several outlets if desired, but a single switch may not control more than one relay.

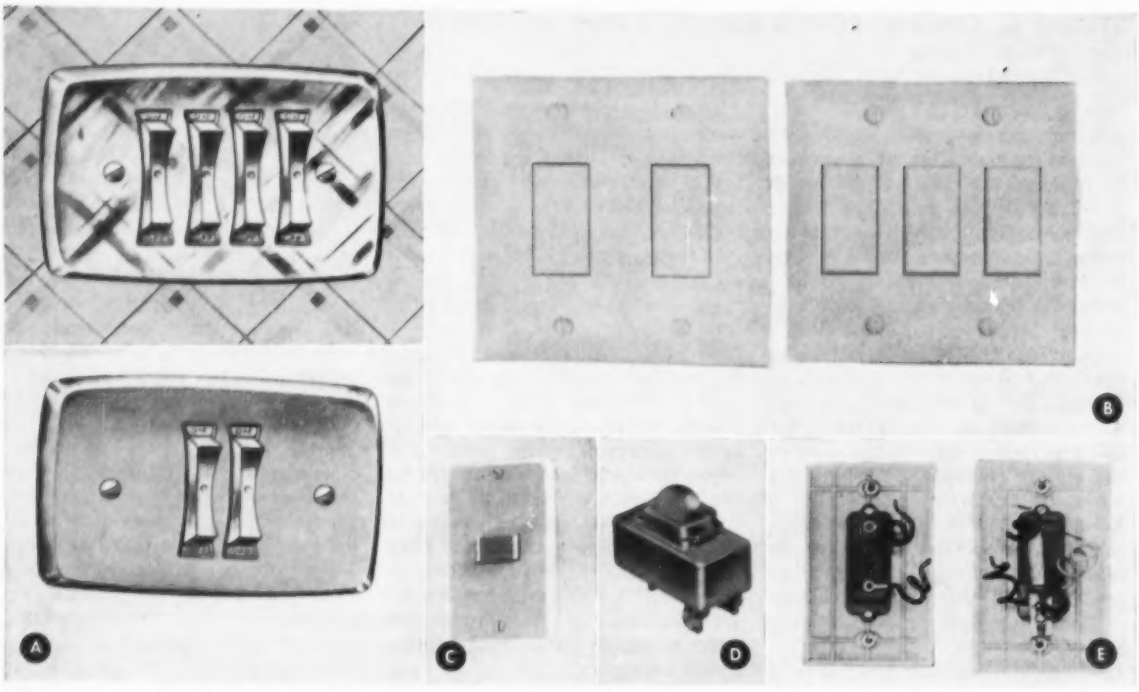
Switches: Switches are momentary-contact pushbuttons. Pressing switch energizes relay and closes circuit to load; pressing switch again energizes relay again and opens circuit to load. There are no "on" or "off" positions of switch.

Switches are connected using only low-voltage conductors. They are mounted in switchplates in gangs of 1, 2, 3 or 6 switches. Plates are mounted on standard outlet boxes or switch plaster rings; a box is not necessary.

A special switch and pilot light assembly is available for control of outlets which are out of sight of the switch, since there is no "on-off" designation on the switches. Two additional low-voltage conductors are needed to connect the pilot light with a special 115/3-volt transformer mounted in the relay cabinet. Each pilot-light application requires its own transformer. Up to 6 pilot-lighted switches controlling the same outlet plus any number of standard switches may be connected to the same transformer. A small hole in the switch button makes the pilot light visible.

Master Control: Six-gang assemblies of switches and pilot lights on double-size switchplates are used for master control, providing visual indication of energized outlets. Larger panels combine two or three of these 6-gang units, providing individual control of 12 or 18 relays, respectively. Appropriate cables and relay cabinets are available for such applications. There is no provision in these master units for operating switches simultaneously.


(Line-voltage wiring, indicated by heavy lines, may be reconnected inside cabinet if more than one branch circuit feed is required. A separate branch circuit for the power supply is desirable where relays are used on more than one circuit.)
110-volt ac
Load A
Load B
Load C
Load D
Load E
Load F
Power supply is mounted on relay cabinet (Only one power source is required for entire system.)
* Momentary impulse voltage
110/24 v* dc
Pilot light transformer
Relays
Common conductor to power supply is internally wired
Relays
Relay
6-relay cabinet, internally wired at factory
Pilot light transformer (Note: when relay cabinet is used with master control panel, each relay has a pilot light transformer. Space is provided for as many as 6 transformers.)
To master control panel, if used
No 18 low-voltage wiring
Switch-pilot light assemblies
Single-gang switches
Switches may be paralleled at relay cabinets if more convenient
To switches fed by other relays
Common conductor from power supply feeds all switches
Note that switches incorporating pilot lights require 2 extra wires. Since both switches control load A, both pilot lights may be fed by the same transformer.
Theses 2 switches control load C
3-gang switch at one location controls loads C, D and E
2-gang switch controls loads E and F
Single-gang switch with pilot light
SYSTEM A TYPICAL RELAY CABINET AND LOCAL SWITCH CONNECTIONS
14-conductor cable to 6-gang relay cabinet
To three pilot light transformers
Common to power supply
To six relays
Common to pilot light transformers
To three pilot light transformers
MASTER CONTROL UNIT



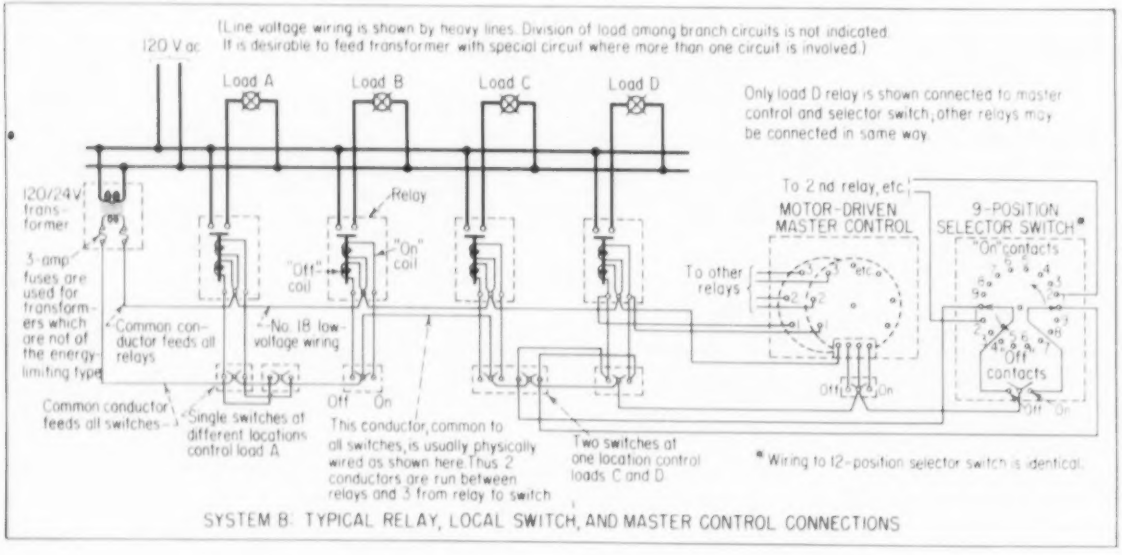
MOMENTARY CONTACT SWITCHES. (A) Two styles of 3-wire switches. 4-position unit at top uses transparent plate; 2-switch unit below is of solid buff plastic. (B) 2- and 3-gang 2-wire switch units. (C) Single 3-wire switch and plate assembly. (D) 3-wire switch. Unit mounts in standard 3-position Despard-type bracket. (E) Rear view of single-gang switches of type shown in (B). Unit at right has pilot light mounted behind switch.

SYSTEM B: CENTRAL POWER SUPPLY, 3-WIRE SWITCHING

Power Source: These systems use a single 120/24-volt transformer for low-voltage operation of relays and switches. It is usually installed at the panelboard and fed by an individual circuit. One lead from the transformer is common to all relays, the other to all switches.

Relays: Relays are 2-coil solenoid type T-rated at 20 amps, 120 or 277 volts ac, or ½ hp at 120 volts ac. Energizing one coil closes the load contacts; energizing the other coil opens the contacts. Relays are wired with 3 conductors: one to each coil, one common to both coils. The common goes to the transformer; coil conductors go to switches. Not more than 2 relays may be connected in parallel for operation from one switch. Relays are designed to be inserted through ½-in. knockouts, either in outlet boxes or in a relay cabinet.

Switches: Momentary-contact switches are wired with three No. 18 conductors, 2 wires going to the


(Line voltage wiring is shown by heavy lines. Division of load among branch circuits is not indicated. It is desirable to feed transformer with special circuit where more than one circuit is involved.)
120 V ac
Load A
Load B
Load C
Load D
Only load D relay is shown connected to master control and selector switch; other relays may be connected in same way.
120/24 V transformer
3-amp fuses are used for transformers which are not of the energy-limiting type
Relay
"Off" coil
"On" coil
Common conductor feeds all relays
No. 18 low-voltage wiring
To other relays
To 2nd relay, etc.
MOTOR-DRIVEN MASTER CONTROL
9-POSITION SELECTOR SWITCH*
"On" contacts
"Off" contacts
Common conductor feeds all switches
Single switches at different locations control load A
Off
On
This conductor, common to all switches, is usually physically wired as shown here. Thus 2 conductors are run between relays and 3 from relay to switch
Two switches at one location control loads C and D
* Wiring to 12-position selector switch is identical.
SYSTEM B: TYPICAL RELAY, LOCAL SWITCH, AND MASTER CONTROL CONNECTIONS

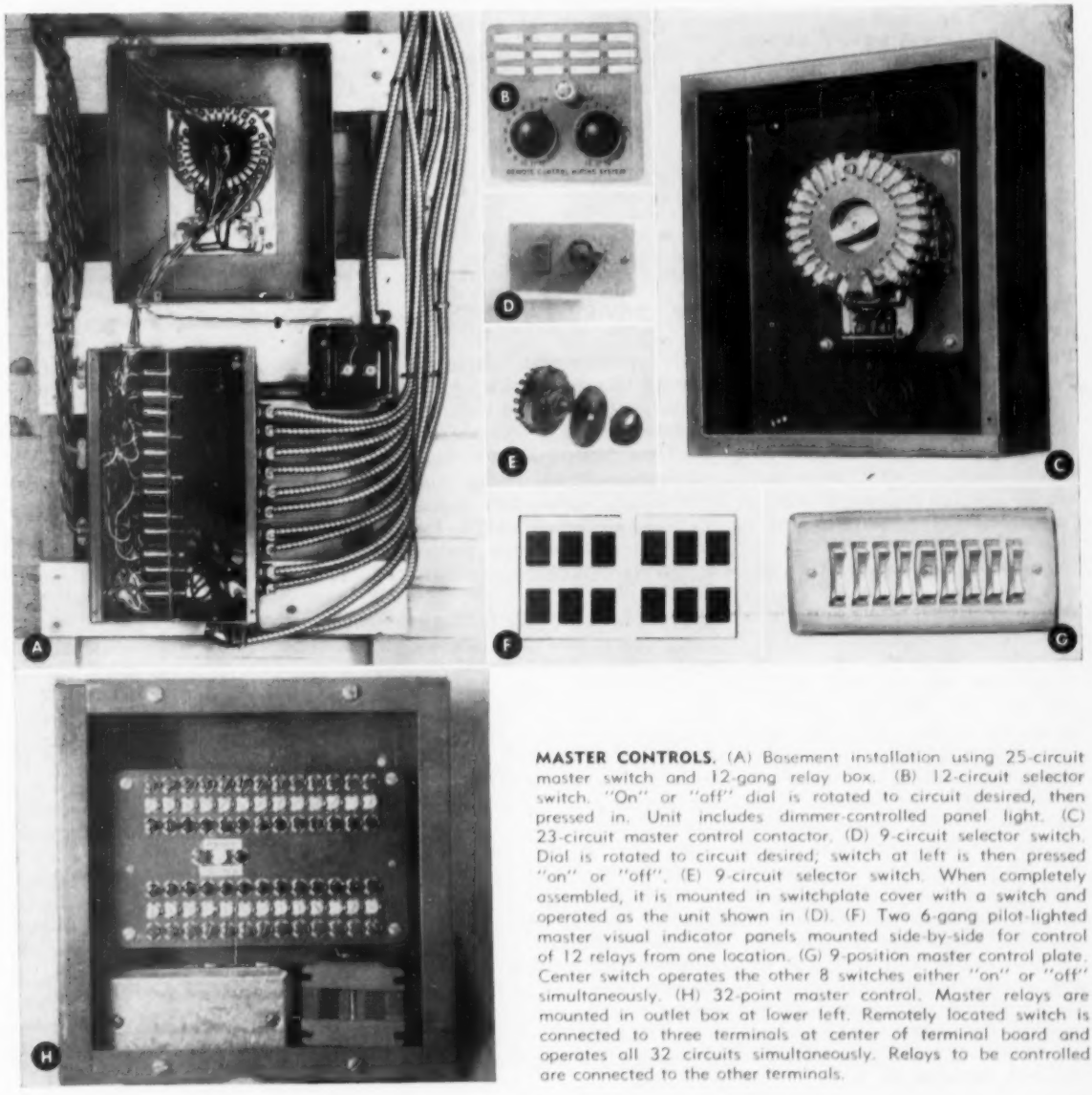
"on" and "off" relay coils and the other being the transformer common. Switches are designed to fit the standard 3-position mounting brackets used with interchangeable-line wiring devices, although the customary box is not required. Thus, switches may be installed in vertical groups of 1, 2 or 3 switches each, and a standard interchangeable-line double switchplate would accommodate up to 6 switches. Where restricted switching is desirable, a keyed switch is used.

Master Control: Either manual selector switches or motor-operated masters are available. The 9-position manual selector switch mounts on a standard single switchplate. It consists of a single momentary-contact switch plus a circular dial which may be turned to any one of the 9 circuits to be controlled. Pressing the switch "on" or "off" operates the circuit to which the dial is set. If the switch is held in either the "on" or "off" position and the dial rotated, all circuits may be switched in sequence.

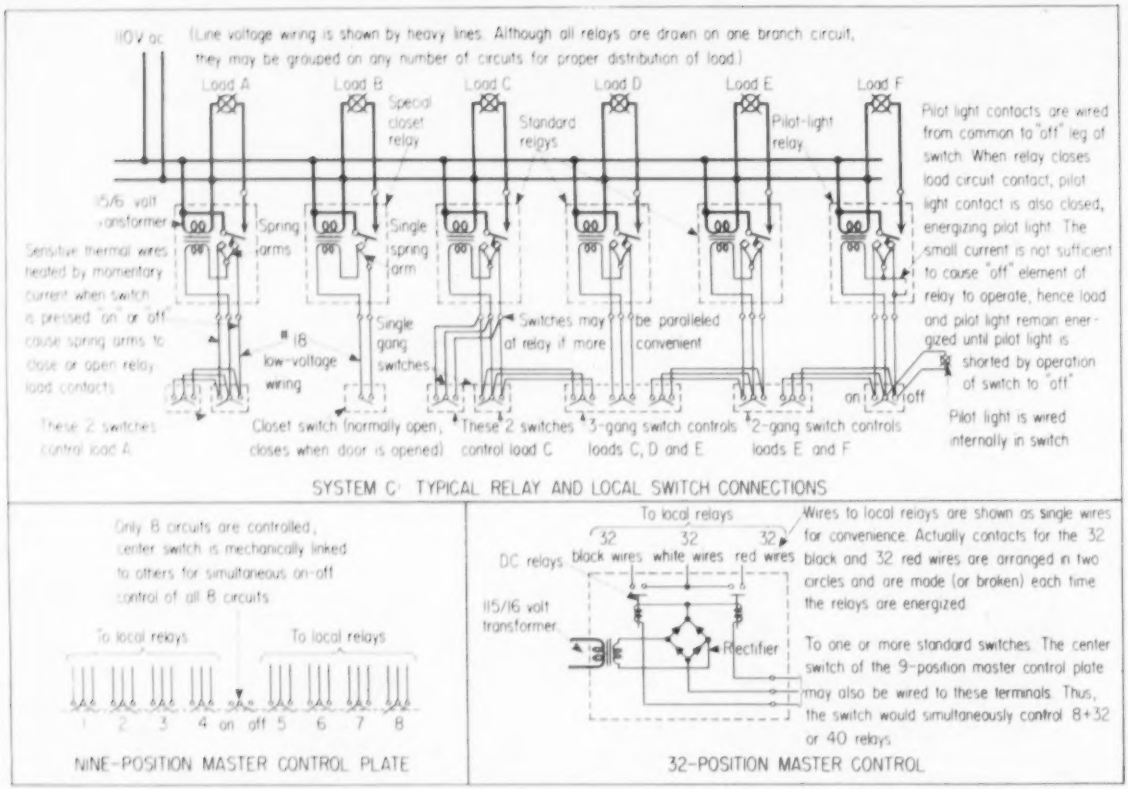
A new 12-position manual selector switch which mounts on a double switchplate has separate dials for "on" and "off" operation. The dial is set for the circuit desired and then pressed in to accomplish the switching. Rapid-sequence switching of all circuits is done by depressing and rotating the dial.

The motor-operated masters have no provision for control of individual circuits. A rotating arm turns the circuits on or off in rapid sequence. One or more single momentary-contact switches may be connected in parallel to control the master.

Flexibility in the use of these multi-position master controls may be obtained by the manner in which they are connected. For example, it may be desired to turn on a night light circuit when all other lights are turned off. This may be accomplished by connecting the two conductors from this relay in reverse on the master control. Thus, when the master control switch is pressed to the "off" position, the night light circuit will go on; all others will go off.



MASTER CONTROLS. (A) Basement installation using 25-circuit master switch and 12-gang relay box. (B) 12-circuit selector switch. "On" or "off" dial is rotated to circuit desired, then pressed in. Unit includes dimmer-controlled panel light. (C) 23-circuit master control contactor. (D) 9-circuit selector switch. Dial is rotated to circuit desired; switch at left is then pressed "on" or "off". (E) 9-circuit selector switch. When completely assembled, it is mounted in switchplate cover with a switch and operated as the unit shown in (D). (F) Two 6-gang pilot-lighted master visual indicator panels mounted side-by-side for control of 12 relays from one location. (G) 9-position master control plate. Center switch operates the other 8 switches either "on" or "off" simultaneously. (H) 32-point master control. Master relays are mounted in outlet box at lower left. Remotely located switch is connected to three terminals at center of terminal board and operates all 32 circuits simultaneously. Relays to be controlled are connected to the other terminals.


110V ac
(Line voltage wiring is shown by heavy lines. Although all relays are drawn on one branch circuit, they may be grouped on any number of circuits for proper distribution of load.)
Load A
Load B
Special closet relay
Load C
Standard relays
Load D
Load E
Pilot-light relay
Load F
Pilot light contacts are wired from common to "off" leg of switch. When relay closes load circuit contact, pilot light contact is also closed, energizing pilot light. The small current is not sufficient to cause "off" element of relay to operate, hence load and pilot light remain energized until pilot light is shorted by operation of switch to "off"
115/6 volt transformer
Spring arms
Single spring arm
Sensitive thermal wires heated by momentary current when switch is pressed "on" or "off" cause spring arms to close or open relay load contacts
#18 low-voltage wiring
Single gang switches
Switches may be paralleled at relay if more convenient
on
off
Pilot light is wired internally in switch
These 2 switches control load A
Closet switch (normally open, closes when door is opened)
These 2 switches control load C
3-gang switch controls loads C, D and E
2-gang switch controls loads E and F

SYSTEM C: TYPICAL RELAY AND LOCAL SWITCH CONNECTIONS

Only 8 circuits are controlled; center switch is mechanically linked to others for simultaneous on-off control of all 8 circuits
To local relays
To local relays
1 2 3 4 on off 5 6 7 8

NINE-POSITION MASTER CONTROL PLATE

To local relays
32 32 32
DC relays
black wires white wires red wires
115/16 volt transformer
Rectifier
Wires to local relays are shown as single wires for convenience. Actually contacts for the 32 black and 32 red wires are arranged in two circles and are made (or broken) each time the relays are energized.
To one or more standard switches. The center switch of the 9-position master control plate may also be wired to these terminals. Thus, the switch would simultaneously control 8+32 or 40 relays.

32-POSITION MASTER CONTROL

SYSTEM C: LOCAL POWER SUPPLY, 3-WIRE SWITCHING

Power Source: No central power supply is used. A miniature energy-limiting 115/6-volt transformer is contained within each relay. Each outlet to be switched has its own relay-transformer unit, hence there are no common conductors run between switches or relays to provide low-voltage current.

Relay: The standard relay used is a dual thermal element latching type, a separate element and spring arm being used for "on" and "off" operations. Three wires are used to connect the relay to each switch: one "on", one "off" and a common. Operation of the "on" spring arm closes the load contacts; operation of the "off" spring arm opens the contacts. There are normally three line-voltage leads: the hot line conductor, the hot load conductor, and the neutral, which is common to both line and load. The standard relay is also available with a load neutral in addition to the line neutral so that the loads controlled by several relays operating on a 3-phase distribution system may be balanced among the 3 phases and yet permit all transformers to be fed from the same phase.

Relays are mounted through ½-in. knockouts in an outlet box, either at the location of the fixture to be switched or at a location remote from the fixture. Line-voltage connections are made inside the box; low-voltage conductors from the switches are spliced outside the box to the leads from the portion of the relay protruding through the knockout.

A closet light relay is also available having only two low-voltage leads and a single thermal element spring arm. The relay is controlled by a low-voltage, normally open door switch mounted in the closet door frame and wired to the relay with two No. 18 conductors. When the door is opened, the switch closes and operates the relay. Unlike the standard relay, this relay operates continuously as long as the switch is on.

A relay is now being field-tested for use with pilot-light switches. A low-voltage contact to energize the pilot light is added to the standard relay. This arrangement makes it unnecessary to run additional conductors to the switch to feed the pilot light.

Switches: Momentary-contact switches used have "off" and "on" positions. Three-conductor cable (usually No. 18) is used to connect the switch with the relay. Terminals on the switches are color-coded to match the colors of the low-voltage leads to the relay. Local switches are furnished in gangs of 1, 2, 3 or 4. Special brackets are used to mount switches on wall; no box is required.

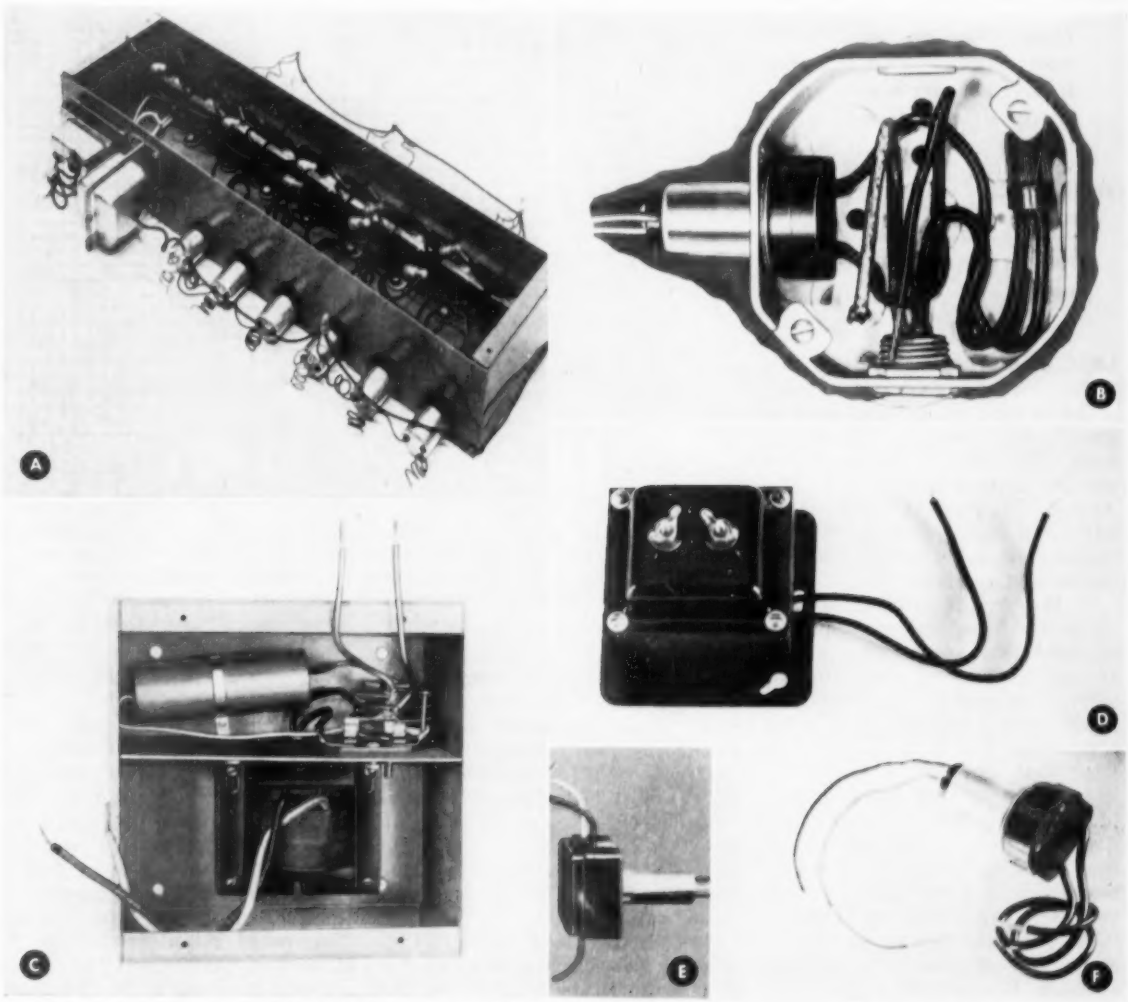
Switches are phosphorescent and glow in the dark for easy locating. Switchplates may be obtained in a buff plastic or a clear plastic with stiff gold-colored paper backing. This may be removed and the plate used without backing, or the backing may be replaced by wallpaper to match room decor. Switchplates are marked to indicate "on" or "off" positions of switch. If a controlled outlet is out of sight of the switch, the switch need only be pressed "off", and no uncertainty exists as to whether the load is on or off.

However, to provide for applications where pilot light supervision is desired, switches are now being field-tested which are identical to the standard switch except that a

tiny lamp is inserted in a hole in the center of the switch arm and capped by a lens, or jewel, to concentrate the light. The lamp is internally wired across the switch contacts. The special pilot-light relay described above is used in place of the standard relay when pilot-light switches are used. A maximum of three pilot-light switches may be connected in parallel to control any one relay, although additional switches without pilot lights may be added.

Master Control: Two types of master control units are available, controlling either 8 or 32 relays. The smaller of the two, a 9-position master control plate, mounts 9 switches. Eight of these may be used for individual control of 8 relays. The ninth (center) switch is mechanically coupled to all the others so that all 8 outlets may be controlled simultaneously by pressing the center switch. These 8 switches are normally connected in parallel with the local switches located throughout the installation. The center switch, in addition to its mechanical linkage, also has electrical contacts. It is not used to control a single ninth relay, since operation of this switch would automatically cause operation of all other 8 relays. This center switch may be connected to the 32-position master control described below, however, and it would thus simultaneously turn on or off 8 plus 32 or 40 circuits.

Where master control of more than 8 circuits is desired, the 32-position electrically operated unit is used. It is controlled by one or more momentary-contact switches in parallel (one of which may be the center switch of the 9-position control described above). When the switch is pressed "on", a solenoid-type relay operates to bring 32 red "on" wires into momentary contact with 32 white conductors. Similarly, a second relay is used to bring 32 black "off" wires into contact with the white wires. The unit itself may be placed in any convenient location which minimizes the length of wiring required to connect the 32 relays (or any number less than 32). Any number of switches may then be installed to control the master unit.



POWER SOURCES AND RELAYS. (A) 15-gang relay box with transformer and rectifier mounted on box. (These two particular components have more recently been incorporated into a single power supply unit.) Pilot light transformers (not shown) may be mounted in knockouts above relays as required. (B) Relay mounted in outlet box. Fixture connects to two unused wires. (C) DC power unit. This may be used in place of transformer for extra quiet relay operation. (D) 24-volt transformer for central power supply system. (E) Transformer-relay for local power supply system. (F) 2-winding relay. Heavy leads are to 12-volt contacts.

ESTIMATING FORUM—VI

Operating Costs—Use of Research Data as Guide to Overhead Study

By **Ray Ashley,** *Research and Consulting Engineer, Oak Park, Ill.*

QUESTION:

How can an electrical contractor use established research data in a study of overhead?

ANSWER:

As a guide for analyzing his own experienced costs.

DISCUSSION: There has been much research data published* which is used by electrical contractors when studying operating costs. Throughout this series we will find samples of such work. The August 1957 issue of EC&M (page 73) listed operating costs to show the division between direct job expenses and overhead.

In the present article, Figure 1 shows how overhead costs may be expected to vary according to the size of the project. Our attention will be confined to the "Job Overhead" curve which can be used for comparison with experienced overhead costs.

A contractor can get a general idea of how his overhead costs (overall) compare with normal, in the following manner: Compute the experienced overhead on a year's volume. Take a reading from the "Job Overhead" curve in Fig. 1 for an amount equal to the average contract. Compare the curve figure with the experienced overhead figure.

To illustrate, let's use an annual volume of $840,000 representing 120 contracts. The average contract would be $7,000 ($840,000 divided by 120). Assume that the contracts were for complete installations of all material with an M/L ratio of 60/40 (cost of material, 60%; cost of labor, 40%). Note that the curves in Fig. 1 are for contracts with a 60/40 Material-Labor ratio.

The "job overhead" curve in Fig. 1 shows the normal overhead for a $7,000 project to be 17%. If the contractor's experienced overhead was 20%, the curve reading would indicate that his costs were 3% above normal. As previously noted, a comparative study of this type gives only a general idea of overhead status.

For a more accurate comparison of experienced and normal overhead costs, individual jobs or groups of jobs within limited price ranges should be used. Let's assume that ten of the 120 contracts were in the price group of $1,500 to $2,000, and that the total amount of these ten contracts was $18,000. This would mean an average of $1,800 per contract.

Again referring to the "job overhead" curve in Fig. 1, we find the normal overhead for an $1,800 project to be 21.5%. This figure would be applied to the total group

[Continued on Page 112]

FIG. 1

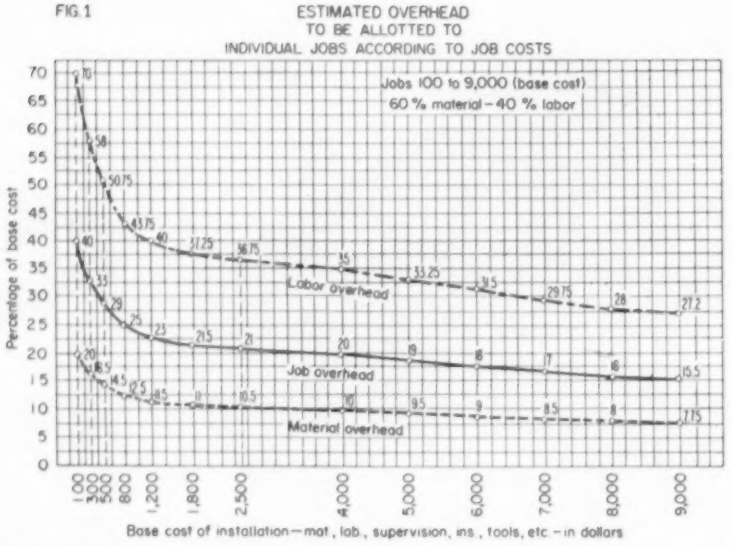

ESTIMATED OVERHEAD
TO BE ALLOTTED TO
INDIVIDUAL JOBS ACCORDING TO JOB COSTS
Jobs 100 to 9,000 (base cost)
60 % material – 40 % labor
Labor overhead
Job overhead
Material overhead
Percentage of base cost
Base cost of installation—mat., lab., supervision, ins., tools, etc.—in dollars

FIG. 1—Overhead curves, such as these established by research, can be effectively used by contractors to check experienced overhead costs. Actual jobs are grouped in relevant price range and curve value for average of group is applied. Total overhead for all groups is compared with total experienced overhead.

*See Electrical Estimating, McGraw-Hill Book Co.

OPERATING COSTS-SHEET 1

ITEMS OF OPERATING COSTS—ELECTRICAL CONTRACTING

A—DIRECT JOB COSTS

MATERIAL-SERVICE

ITEMS OF EXPENSE	EST COST % (SEE NOTE-2)	EST COST DOLLARS (SEE NOTE-2)
I-MATERIAL BY CONTRACTOR		
ENGINEERING & LAYOUT		
ESTIMATING		
SELECTING & PURCHASING		
FOLLOW UP & COORD DELIVERY		
CARTAGE & SPECIAL DELIVERY		
STORAGE FACILITIES-FIELD		
FIELD TEL-PRORATA		
SPECIAL REPORTS-DEFENSE REQ		
ASSOCIATION DUES		
II-MATERIAL BY OWNER		
ENGINEERING & LAYOUT		
ASSISTING OWNER'S PUR AGENT		
FOLLOW UP & COORD DELIVERY		
STORAGE FACILITIES		
PROCUREMENT FAILURES (SEE NOTE 4)		
TOTAL		

LABOR BURDEN

ITEMS OF EXPENSE	EST COST % (SEE NOTE-2)	EST COST DOLLARS (SEE NOTE-2)
TOOLS-CONSUMED & DEPRECIATED		
CARTAGE-TOOLS		
FIELD OFFICE & SHOP BLDGS		
ENGINEERING & LAYOUT		
ESTIMATING		
DRAFTING		
FIELD TEL-PRORATA		
SUPERVISION		
BLUE PRINTING		
HEAT & LIGHT-FIELD OFFICE & SHOP		
POWER WIRING & CURRENT-FIELD SHOP		
TRAVEL EXPENSE		
INSURANCES		
INSPECTION		
PRORATA CHARGES		
ASSOCIATION DUES		
INTEREST ON PAYROLL		
PROCUREMENT FAILURES [MATERIAL BY OWNER-LAB DISRUPTIONS (N-4)]		
RES FOR CONTING & GUARANTEE		
TOTAL		

B—GEN. OVERHEAD & ADMIN. EXPENSE

ITEMS OF OPERATING COSTS NOT IDENTIFIED WITH ANY PARTICULAR PROJECT

ITEMS OF EXPENSE	CHECK FIG SEE N-1 %	EST COST % (SEE NOTES-2 & 3)	EST COST DOLLARS (SEE NOTES-2 & 3)
ADMINISTRATIVE SALARIES	5.00		
ENGINEERING & EST-MISSIONARY WORK	0.80		
BOOKKEEPING-GEN	1.04		
SPEC BOOKKEEPING-INS & TAXES	0.52		
STENO & TEL OPER	0.45		
STORE RM ATTENDANT	0.67		
UTILITY BOY	0.37		
RENT-OFFICE (INCL HEAT)	0.70		
RENT-STORE RM (INCL HEAT)	0.20		
LIGHT	0.12		
TELEPHONE	0.35		
OFFICE EQUIP & FURNITURE	0.25		
STATIONERY, EST FORMS, & MISC SUPPLS	0.29		
POSTAGE	0.13		
TAXES & LEGAL EXP	0.25		
ADVERTISING	0.20		
INSURANCE ON EQUIP & MISC EXP	0.85		
RESEARCH & TIME STUDIES			
ADJ FACTOR-FOR VOL FLUCTUATION	0.60		
TOTAL			

NOTES-

1-PERCENTAGES COMPILED FROM SURVEYS OF COMP INSTALL WORK, INCL ALL MATERIAL
2-COLS TO BE FILLED IN WITH FIGURES SUITABLE TO THE PROJECT BEING ESTIMATED
3-SEE TABLE ON "OPER COSTS-SHEET 2" FOR DIV OF GEN OH & ADMIN COSTS
4-MATERIALS & EQUIPMENT PURCHASED BY OWNER MAY NOT BE DELIVERED AS PER SCHEDULE OR MAY NOT BE ADAPTED TO THE INSTALLATION. THIS INCREASES EXPEDITING COSTS AND CAUSES LOSS OF LABOR DUE TO DELAYS AND LABOR DISRUPTIONS

ESTIMATING FORUM VI - FIG. 2

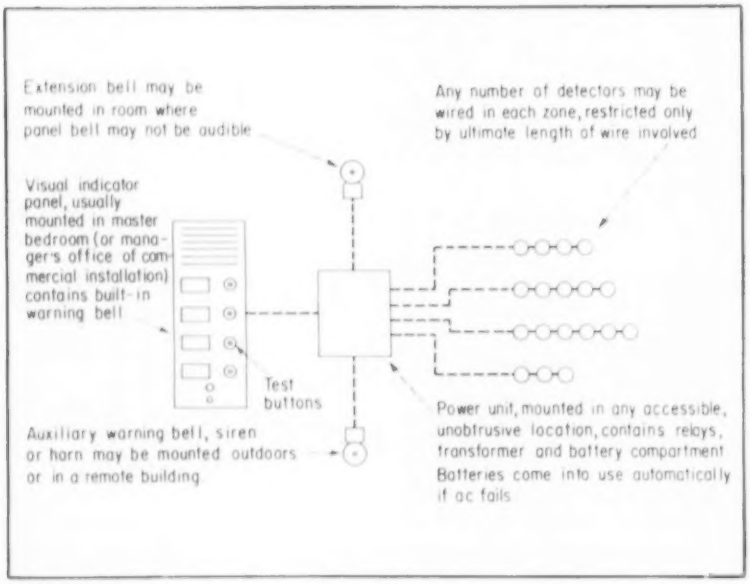
FIG. 2—Itemized list of operating cost expenses can be used for estimating individual jobs or checking experienced operating costs. For cost checking, total of items on sheet should equal the total of all experienced costs.

"LEARN YOUR PRODUCT inside and out . . . know what you're talking about."

Long Island Contractor's

FIRE ALARM SALES

are direct result of energetic promotion and successful merchandising ideas.

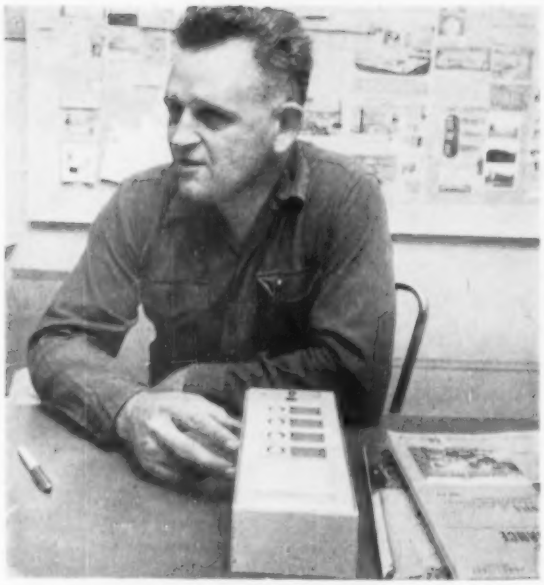

Extension bell may be mounted in room where panel bell may not be audible
Any number of detectors may be wired in each zone, restricted only by ultimate length of wire involved
Visual indicator panel, usually mounted in master bedroom (or manager's office of commercial installation) contains built-in warning bell
Test buttons
Auxiliary warning bell, siren or horn may be mounted outdoors or in a remote building
Power unit, mounted in any accessible, unobtrusive location, contains relays, transformer and battery compartment. Batteries come into use automatically if ac fails

THE increasing importance of the sale and installation of fire alarm systems to the residential and commercial work of Elmont Electric, Massapequa, N. Y., is due to the enthusiastic selling ideas of Carl Tiersch, partner of the Long Island firm.

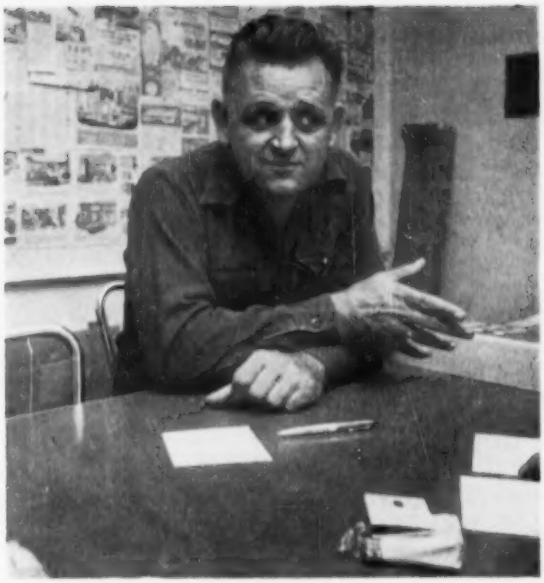
Tiersch's efforts follow four general principles, the first three applying before the sale and the fourth after:

1. Know the product
2. Reach the customer

INDICATING ALARM SYSTEM is current mainstay of Elmont Electric's fire alarm sales. Detectors close circuit when ambient air reaches tripping temperature. Power unit components function to ring all alarm bells and provide visual indication of zone originating alarm. Where more than four zones are desired, additional indicator panels may be wired to the power unit.



"USE DEMONSTRATOR UNITS . . . they do the job better than any sales talk."



"SIT DOWN WITH THE CUSTOMER . . . show him what you have . . . explain the product features."

3. Demonstrate the product
4. Satisfy the customer

With respect to any particular product or service, a contractor often neglects or leaves to chance one or more of these points due to the press of work or lack of enterprise. Elmont Electric believes that a successful sales job with prospects for repeat business demands proper attention to all four.

"Know the Product"

Currently leading the company's fire alarm sales is a new indicating alarm system which, in addition to giving immediate warning of a fire, indicates its location. Aware that people are becoming more fire-conscious through previous sales of the simpler home alarm systems, Tiersch was quick to get details of the new system from the local sales representative.

He studied the manufacturer's literature carefully. He checked general system operation against existing standards and recommendations for authoritative information on where the equipment may and may not be used, realizing that advising the customer of the product's limitations as well as its advantages goes far to insure final satisfaction.

He went over the manufacturer's wiring diagrams and installation instructions, examining in detail the system components left with him by the sales representative. He evaluated the installation work involved with respect to his own operation and manpower and made rough estimates to cover typical building constructions.

"Reach the Customer"

Satisfied with the product's quality and sales potential, Tiersch initiated several steps designed to bring the product to the attention of the prospective customer:

(1) Mailings of manufacturer's literature were made to all previous customers and prospects on file.

(2) Demonstration models of the system were put in model homes in surrounding areas which were open daily to the public.

(3) The product was brought to the attention of local builders' real estate salesmen.

(4) Equipment displays were set up at a local permanent exhibit visited daily by the building industry and the general public.

(5) Architects were contacted with whom he frequently works on original designs.

Prominent in the mailing list are operators of filling stations, shopping centers and supermarkets in the surrounding area. This alarm system, with the panel in the manager's office, is ideal for providing advance warning of fires in stockrooms and storage areas.

"Demonstrate the Product"

Those who make inquiries in response to this promotion either are visited personally with demonstrator units or are invited to the Elmont showroom. In addition to explaining the equipment in detail, facts and statistics on property damage and deaths due to fires are used to emphasize the importance of prompt detection.

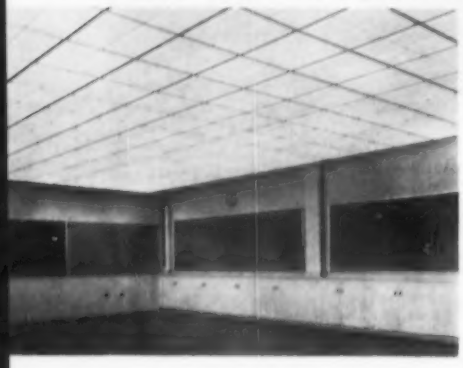
Where practical, personal visits are made with the customer to actual installations which are similar to that proposed for the customer.

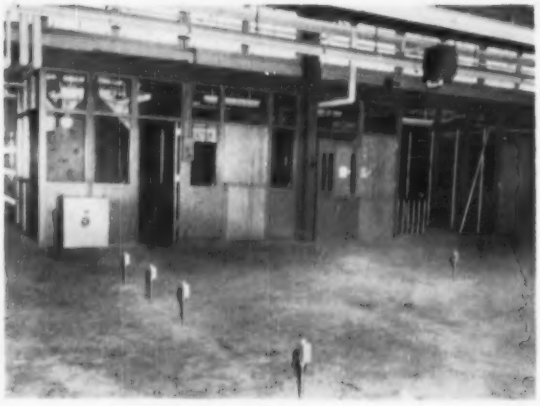
"Satisfy the Customer"

Tiersch believes that the choice by the contractor of a reputable product at the outset goes a long way toward insuring ultimate customer satisfaction. However, he follows up with personal supervision of every installation, paying particular attention to such points as the proper selection and location of detectors, the advisability of using extension belts, a complete, thorough test of wiring in each zone for correct operation, and a final meeting with the customer on methods of testing the equipment.

GYMNASIUM is lighted with high-bay prismatic lens units on 14-by 17-ft spacing with mounting heights of from 20 to 26 ft. Lamp sizes are 1,000 watts. Control panel is at the corner of the gym.

TYPICAL CLASSROOM with luminous ceiling of such low brightness that the lighting is not apparent. However, footcandle levels of around 45 to 50 are evenly distributed throughout the room.





MACHINE SHOP with conduit stubs to supply power to all machines. Dry-type 120/240-volt transformer on the floor near the shop office at left. Lighting is by louvered industrial-type units at 277 volts.

New multi-building school plant has

Luminous Ceilings on 277 Volts

Spread-out high school facility in El Sobrante, Calif., has primary service, 277/480-volt distribution and 47,000 sq ft of luminous ceilings in classrooms and library.

WHEN the modern factory for knowledge — a school — is spread out over considerable acreage as modern factories are wont to do it is logical to use similar type of lighting and electrical distribution to serve the needs of the "industry." An example of this is the De Anza High School in El Sobrante near Oakland, Calif. The school plant spreads over 52 acres and is designed to provide for 1,250 students. Its electrical facilities are unique in that it has—

—Luminous ceilings for all classrooms and library. There are 47,000 sq ft of luminous ceiling.

—A 480-volt distribution system.

—All overhead lighting at 277 volts and switched at that voltage by new quiet type switches.

—Transformers of 120/208, dry type, 3-phase, 4-wire, for all convenience receptacles and shop power.

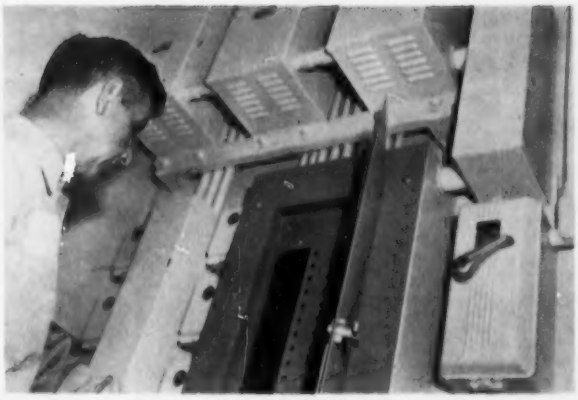
—A 75-kva transformer, 120/240 volts, for domestic science classroom electric ranges.

—A master control electrical system for all of the heating.

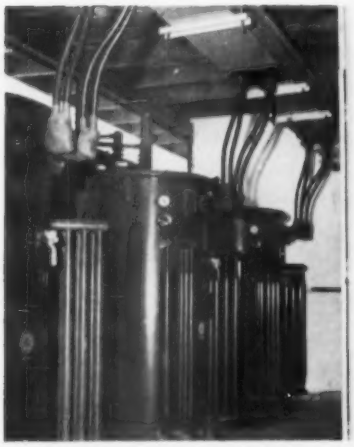
—A security lighting system employing damage-proof, totally enclosed, shielded fluorescent fixtures. This is on a time-clock control.

—Extensive fire alarm, program, clock and bell systems as well as a complete sound and intercom-

ONE OF THE CORRIDOR distribution centers containing panels for the 277-volt lighting and the 120-volt receptacle circuits.



REAVE TEAGUE, general foreman for Spott Electric Co., shows lighting panel in a janitor's closet. Above are three 10-kva, 480-volt to 120/208 transformers. At the side of panel are heating control relays. Main disconnect for the transformers is at right.



SUBSTATION with three 333-kva transformers. Power is received at 12,000 volts from the utility and stepped down to 480 volts for distribution.

LIKE THE DISTRIBUTION PANEL for lighting, a similar cabinet is located across the corridor for the various signal, telephone, bell and sound systems.

IN WOODWORKING SHOP the three dry-type transformers are mounted above the door. Lighting and power panelboards are located on each side of the door.

municating telephone system.

Despite these electrical features, G. M. Simonson, consulting electrical and mechanical engineer, found that the luminous ceilings and the distribution method were economical and cost no more than conventional lighting or distribution would have cost.

The school building plant itself is 170,000 sq ft in area of single story buildings. To supply these buildings at best efficiency Frank Takken, electrical engineer for Simonson, designed a 480-volt system. Power is taken at 12 kv from Pacific Gas and Electric Co. through an underground service from a pole outside the school grounds to a substation at the other extreme of the grounds. This long feeder line is encased in concrete duct. From the substation and main switchgear 480-volt lines are run to the various buildings. The substation contains three 333-kva transformers.

The feed to the various buildings is also carried underground in fiber duct encased in concrete. The feeders terminate in distribution panels in each of the buildings. An enclosed corridor joins the various buildings. It likewise serves for locker space along the aisles. The panels for the 480-volt lines in each building are then placed in these corridors and the dry-type transformers to step down to lower voltages located in such panels or in closets close to the panels.

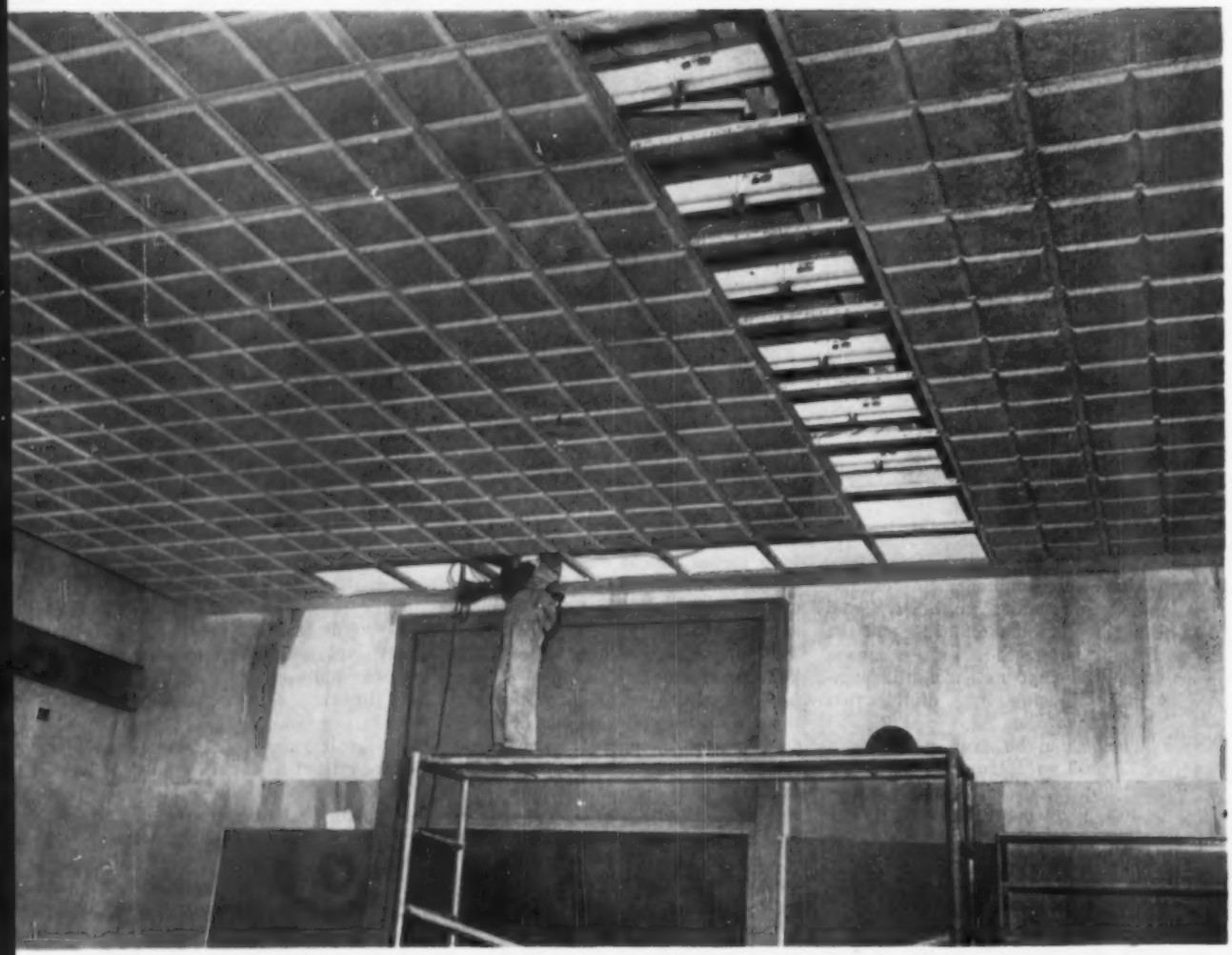
The sound and communication systems have another panel on the opposite side of the corridor. Thus the systems are separated and the panels give a uniform appearance from the hallway.

All lighting equipment above 8 ft from the floor is served by the 480/277-volt supply. This includes 47,000 sq ft of luminous ceiling in classrooms and the large library. The lighting fixtures used for the corridors, lavatories, administrative offices, cafeteria and outside security lighting likewise is served at 277 volts. The gymnasium, however, is not.

In the latter, high-bay units with 1,000-watt incandescent lamps are

CORRIDOR BETWEEN BUILDING showing the arrangement of the lighting units of the protected type along both sides of the ceiling skylights. Lockers are on the walls on each side.

HOME ECONOMICS ROOM with built-in electric range. Cabinet at corner contains a panel for circuit breakers for the ranges and other appliances.



LUMINOUS CEILING PANELS removed to permit electricians to install the sound system. The spacing of the fluorescent lamps above the plastic diffusers is seen in this picture.

supplied 120 volts from dry-type transformers.

Because so much of the building is exposed on the outside and the corridors, lavatories and other public areas are not supervised, it was planned to make the lighting fixtures as tamper- and damage-proof as possible. To do this, plastic-enclosed surface units were selected. Ease of maintenance was an added factor in this selection. The illustrations show the mounting of these fixtures along the corridor and up a stairway between the main buildings and the shop building. Likewise they were vertically mounted along the outside of the shop buildings for night illumination.

All of the luminous ceilings consist of double panels of translucent plastic. These not only diffuse the light but absorb sound. The ceilings are installed 24 in. below strips of 40-watt rapid start fluorescent lamps on 32-in. centers. The system was designed to give 50 ft-c maintained levels. The initial levels exceeded the requirement considerably.

Where lower voltages are needed for convenience outlets or where 208 volts were required for shop tools and motors as well as fans or local lighting, dry-type transformers were installed to provide the necessary voltage. In the shop areas these were encased in metal cabinets placed on the floor ot one side of the shop. For the domestic science electric ranges, the transformers were located in the basement.

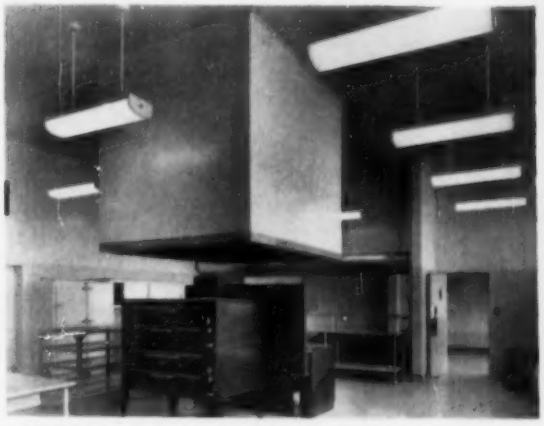
In the gymnasium, spacing of the lighting units is on 14- by 17-ft centers with varying mounting heights because of the dome roof. Under the center of the dome they are 26 ft from the floor and 20 at the sides.

The type of construction posed some problems for the electrical contractor, Spott Electric Co. of Hayward. Much of the building was done with lift-slab construction. Outlet boxes were cast into these slabs before they were lifted in place. However, connection to these boxes from an underground conduit system through a concrete floor slab posed some difficulties. For the gymnasium walls, which are placed on a concrete base, an outlet box was cast into this base with a piece of conduit stubbed up

LIGHTING over stairway to shop buildings and on window frames was by tamper-proof units.

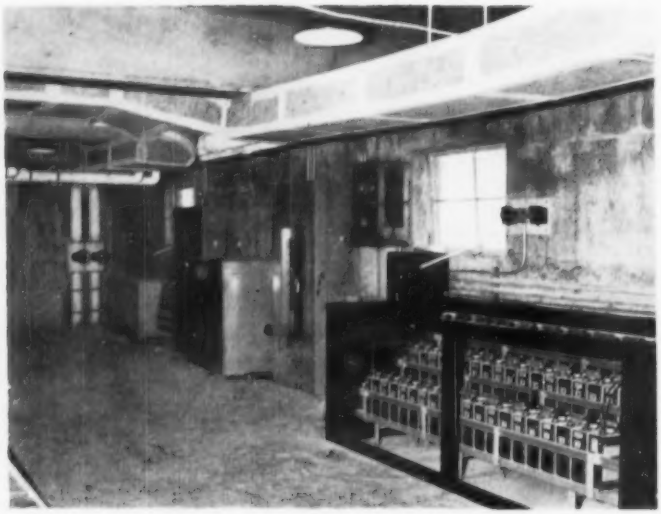
SEALED TYPE of units are used in the cafeteria kitchen and other unsupervised areas.

LIGHTING in a shower room. The lighting units are vapor-proof.



KITCHEN of the cafeteria with electrical kitchen equipment. Lighting makes use of 2-lamp vaporproof units.

METHOD used by contractor to connect the lift slab outlet at top to the outlet box shown at the bottom. Conduit was fed up through the concrete base of the wall.



RANGED ALONG THE WALL of the basement under the library are various panels and electrical facilities. At the far end, left, is the telephone terminal cabinet and a pull box for the telephone circuits. To its right along the wall is the main pull box for power supply from the substation. Next to it is a distribution switchboard and then a 112½-kva, 3-phase transformer. A distribution panel is located next and then a lighting panel and a battery charger. The fire alarm control panel is next to the large fire alarm battery. Not seen are a signal terminal cabinet, a 75-kva, single-phase transformer for the kitchen ranges and signal cabinets.

A SWITCHING and transformer closet between two of the buildings. Enclosed switchgear is at left, transformers in the cabinets farther back. Lighting panel is on the right.

from it. A connection then was made by this short piece of conduit to the outlet box in the wall slab placed above it. The illustration above shows how this installation was made.

Other instances called for surface mounting of some of the conduit, but the appearance has not been marred since the installation was made neatly and painted to match the finish trim. Stubs were provided through the concrete floor in the shop areas for each of the machines. The starter equipment in each case was mounted on the machines, as were the motors.

California regulations respecting luminous ceilings in schools require that the plastic panels be supported on 12-in. centers. This requires a special bar cast into the plastic panels on 1-ft squares. The panels themselves are 2 ft square and the rods supporting the center make a T in the center. Special clamps and hangers for this system of luminous ceiling were required and were fabricated to order.

It often happens that space is not provided for electrical equipment. However, in this school the electrical engineers took advantage of a large storage basement under the library to concentrate much of the control panel equipment. Pull boxes are located here into which the telephone lines and other pull boxes for the power lines terminate. Then distribution switchboards and dry-type transformers are arranged along the wall. Battery chargers and fire alarm and other control panels and signal systems are likewise in a continuous row along the wall on two sides. There may not be so much room for storage of books but this important space for installing electrical facilities at least was available.

Architects for the school were Warneke & Warneke of San Francisco. Provision was made in the plot layout of the school plant for a future auditorium. At the present time the cafeteria doubles as a temporary auditorium. Lighting in the offices and cafeteria is of the fluorescent egg-crate louvered type.

A main feeder distribution center was constructed between two buildings to house the enclosed switchgear handling the feeders from the main substation. Extra room was also provided to house transformers providing 120/208 volts for receptacle and power requirements in adjacent buildings, as well as the lighting panelboard used to switch all outdoor and security lighting system circuits.

TRY HYLUGS FREE IN NEW

flip top box

Wire, Hylug and Stud sizes clearly marked on every box! Separate color-coded boxes for Hylugs and Hylinks. Available in flip-top box thru No. 8. In sturdy corrugated boxes up to 2000 MCM.

BURNDY NORWALK, CONNECT. Dept. ECM-12

I'd like to discover the new easy, handy way to buy and use connectors for small wire installations. Send FREE flip-top box of Hylugs.

NAME_____

COMPANY_____

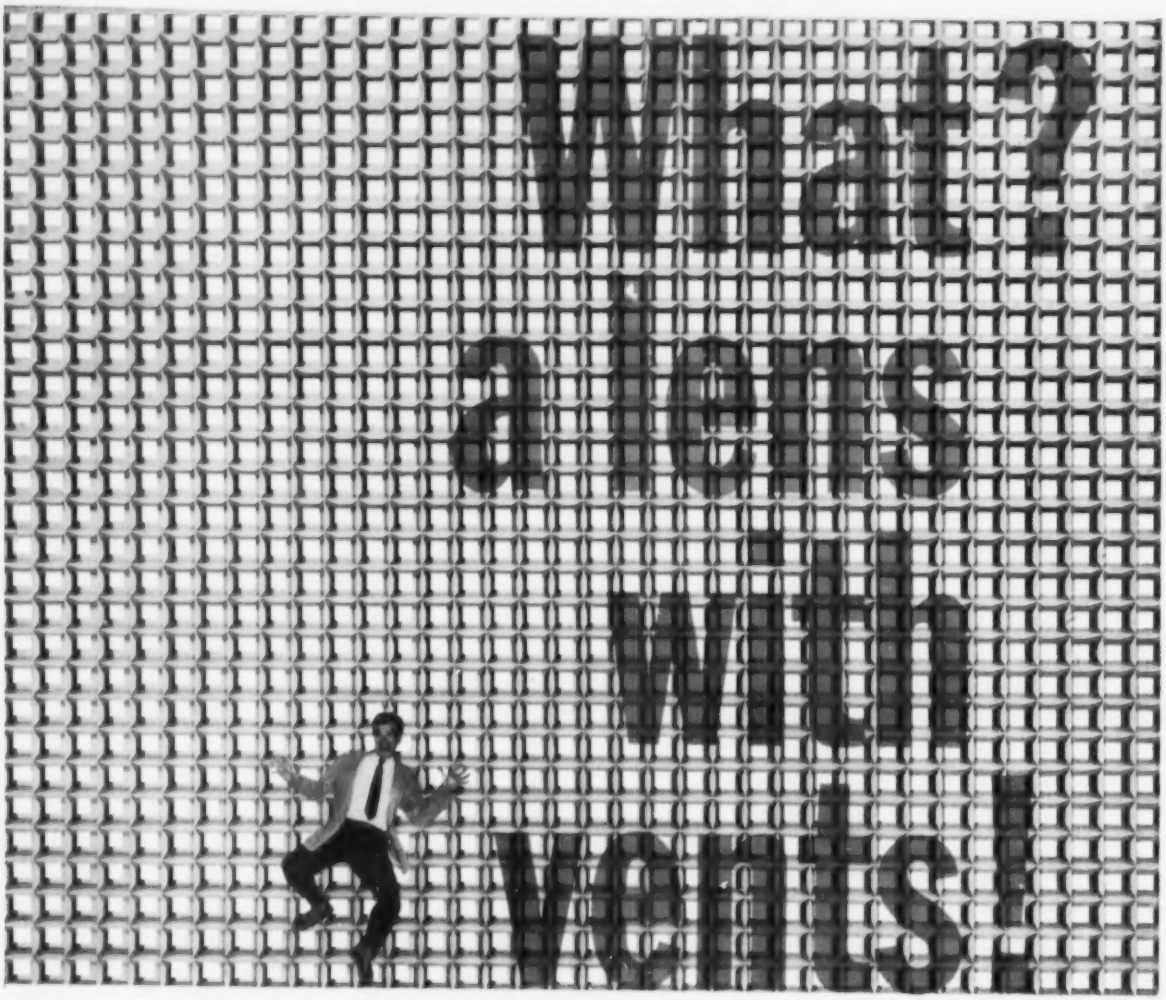
ADDRESS_____

CITY_____ ZONE____ STATE_____

BURNDY

67-17

NORWALK, CONNECT. • SCARBORO, CANADA



ballast men are amazed about Guth Prismoid-GrateLite*

When a recent visitor to our plant saw a section of the new Guth Prismoid-GrateLite lying flat on white paper, his eyes sparkled.

He held it up and exclaimed, "It's great! It's got holes!"

Our visitor was a ballast salesman, and he was mighty happy that the gorgeous new Prismoid has holes. As he explained, almost everyone is enclosing ballasts, cooping up the heat, cutting down fixture depth... making it tougher than ever for ballasts to serve their legitimate lives.

But here is Prismoid, a prismatic louver-lens *with holes!* The ballast salesman said, "It's certainly a step in the right direction!"

Thanks to Prismoid's *breathing action* ballasts get ventilation, lamps are cooled and the flowing air helps keep lamps, Prismoid and fixtures up to 50% cleaner than solid panels.

Guth

PRISMOID GRATELITE
matic Louver-Lens

*T. M. Reg. U. S. & Can. Pats. Pend.

THE EDWIN F. GUTH COMPANY • ST. LOUIS 3, MISSOURI
TRUSTED NAME IN LIGHTING SINCE 1902

Practical Methods

Electronic Analog Computer Specifies Motors and Controls For Steel Mill

ENGINEERING

A new high in rolling efficiency, evidenced by records now being established at Sharon Steel Corporation's new slabbing and blooming mill at its Roemer Works in Farrell, Pa., can be attributed in part to an electric power system which was engineered by an electronic computer.

A year prior to the completion of this $14-million mill, an analogous study was conducted to determine the best power system necessary to achieve maximum utilization of equipment and reduce rolling times. This study was a steel industry "first", for the many various forces to be encountered at each step in the rolling process were simulated, then hundreds of circuit combinations were tabulated on punched cards which were fed into an electric analog computer. This "thinking machine" then digested the statistics and produced charts which were converted by GE engineers into electrical design factors, this sizable task being accomplished in a single day.

From the information so obtained, the engineers were able to specify the most efficient electric motors and control instruments available, and, as indicated by the accompanying drawing, this assembly of drive units totalled 12,000 hp.

One of several important results of this electronically designed project was the development of an improved control system which reduces reversing time on two huge 4000-hp motors to a guaranteed 1½ second interval, this being a 25% improvement over former reversing cycles. Since rolls are reversed from 15 to 20 times during each slab-processing series, this reduction in rolling time represents a very significant gain in year-'round efficiency.

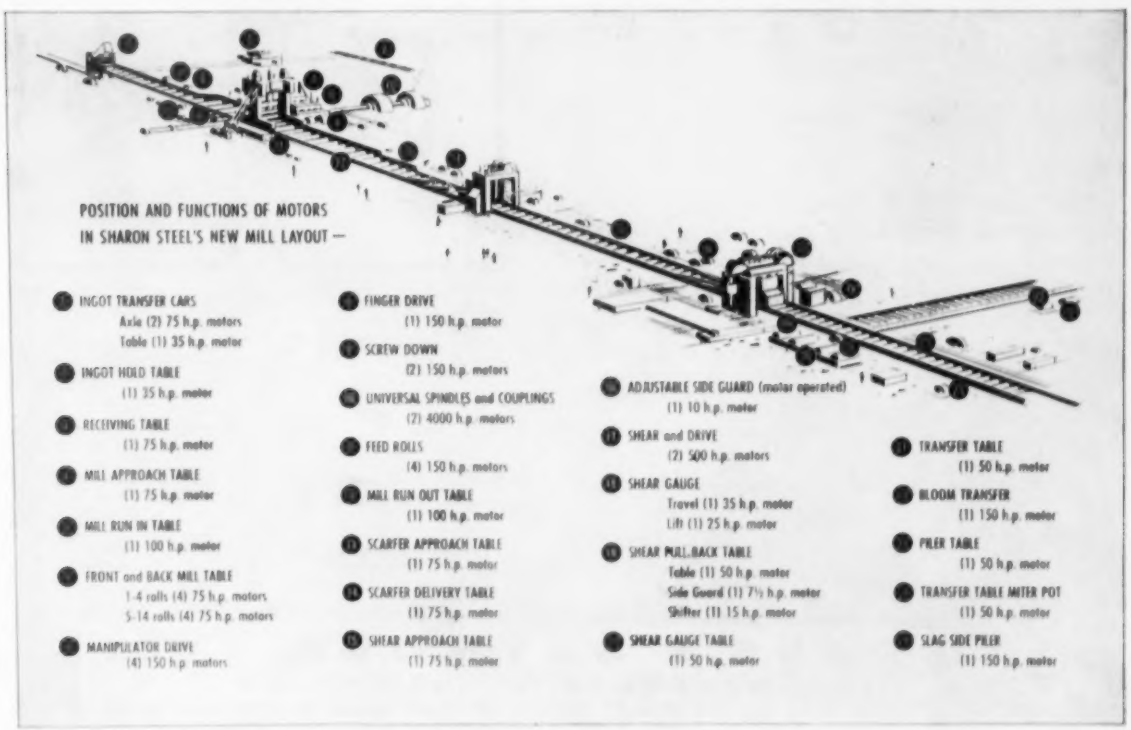
Another efficient by-product resulting from this electronic design approach was the reduction in the mill's "tune up" time. Usually, when a new mill is built, a tryout period of 7 to 10 days is generally required to synchronize the various motors and control components. At Sharon, however, this tune-up period lasted only one day.

Since the new mill went into operation last February, ingot rolling capacity at the Roemer Works has been increased by a third (to 1,200,000 tons a year), and the mill can now process stainless and high-alloy steels for the first time in its history. The mill can produce ingots up to 20 tons each; roll slabs up to 10 in. thick, 4 ft wide and 30 ft long; obtain a complete range of blooms from 4 by 4 to 18 by 18 in.; or produce larger or smaller sizes with any type of steel, if desired.

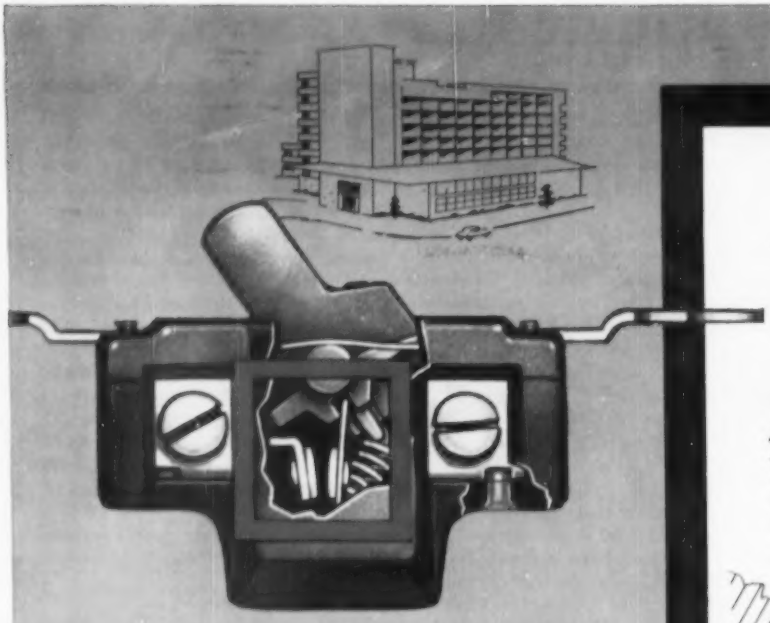
Elevator Scaffold Boosts Job Efficiency

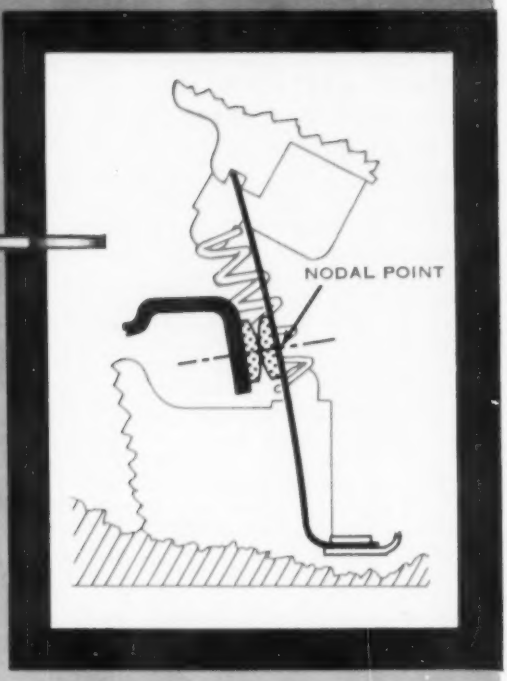
TOOL

A telescoping scaffold designed by F. H. Neumann of Neumann Electric, La Crosse, Wis., increases job efficiency in high-bay installa-


POSITION AND FUNCTIONS OF MOTORS IN SHARON STEEL'S NEW MILL LAYOUT —
1 INGOT TRANSFER CARS
Axle (2) 75 h.p. motors
Table (1) 35 h.p. motor
2 INGOT HOLD TABLE
(1) 35 h.p. motor
3 RECEIVING TABLE
(1) 75 h.p. motor
4 MILL APPROACH TABLE
(1) 75 h.p. motor
5 MILL RUN IN TABLE
(1) 100 h.p. motor
6 FRONT and BACK MILL TABLE
1-4 rolls (4) 75 h.p. motors
5-14 rolls (4) 75 h.p. motors
7 MANIPULATOR DRIVE
(4) 150 h.p. motors
8 FINGER DRIVE
(1) 150 h.p. motor
9 SCREW DOWN
(2) 150 h.p. motors
10 UNIVERSAL SPINDLES and COUPLINGS
(2) 4000 h.p. motors
11 FEED ROLLS
(4) 150 h.p. motors
12 MILL RUN OUT TABLE
(1) 100 h.p. motor
13 SCARFER APPROACH TABLE
(1) 75 h.p. motor
14 SCARFER DELIVERY TABLE
(1) 75 h.p. motor
15 SHEAR APPROACH TABLE
(1) 75 h.p. motor
16 ADJUSTABLE SIDE GUARD (motor operated)
(1) 10 h.p. motor
17 SHEAR and DRIVE
(2) 500 h.p. motors
18 SHEAR GAUGE
Travel (1) 35 h.p. motor
Lift (1) 25 h.p. motor
19 SHEAR PULL-BACK TABLE
Table (1) 50 h.p. motor
Side Guard (1) 7½ h.p. motor
Shifter (1) 15 h.p. motor
20 SHEAR GAUGE TABLE
(1) 50 h.p. motor
21 TRANSFER TABLE
(1) 50 h.p. motor
22 BLOOM TRANSFER
(1) 150 h.p. motor
23 PILER TABLE
(1) 50 h.p. motor
24 TRANSFER TABLE MITER POT
(1) 50 h.p. motor
25 SLAG SIDE PILER
(1) 150 h.p. motor

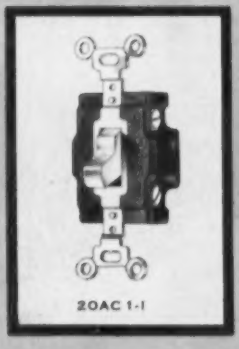
ELECTRONICALLY DESIGNED steel mill has total power drive of 12,000 hp. New slabbing and blooming mill, costing $14-million, came into being as result of statistics and charts produced by electric computer. Electric facilities include more than a hundred motors ranging from 7½ to 4000 hp.

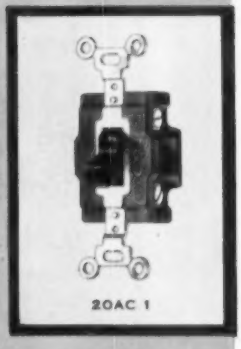




IN P&S A.C. SWITCHES DEPENDABILITY BEGINS WITH THE CONTACTS

Contact vibration is a big factor in the design of A.C. switches. Too much vibration results in arcing, poor contact, and shortened switch life. That's why Pass & Seymour mounts contacts precisely at the point of least vibration of the contact arm – at *the exact nodal point.* Positive kickoff is insured by direct mechanical action of an upright contact arm cradled in a specially designed handle. Switch operation is positive, steady and quiet.





P&S

Mark of Quality

P&S 15 Amp. and 20 Amp. Heavy Duty Switches can be used to full rated capacity on fluorescent and tungsten filament lamp loads.

Write Dept. ECM-33 for free catalog information.

P&S®

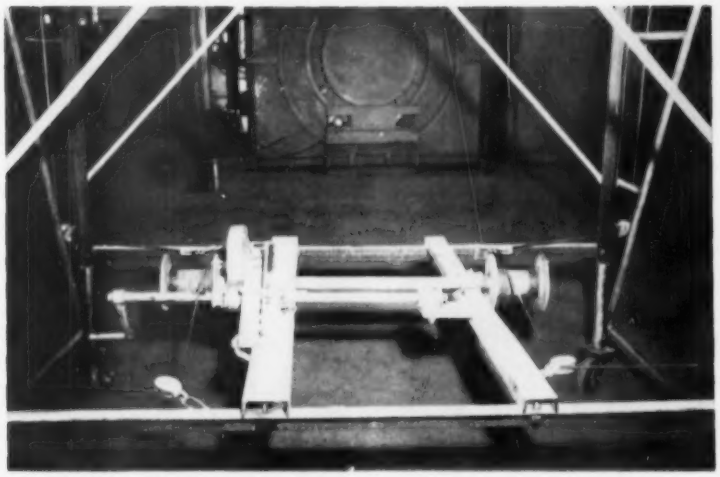
PASS & SEYMOUR, INC.

SYRACUSE 9, NEW YORK

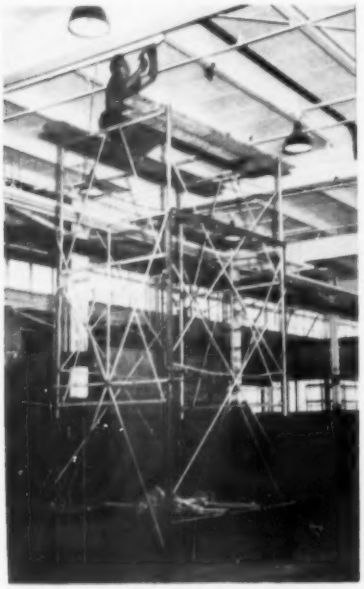
60 E. 42nd St., New York 17, N. Y. 1440 N. Pulaski Rd., Chicago 51, Ill.

In Canada: Renfrew Electric Limited, Renfrew, Ontario

MAKE THE COMPLETE JOB COMPLETELY P&S



TWO-DRUM hoist built into base of angle iron frame uses ¼-in. steel cables to raise and lower conventional 4 ft by 5 ft piping scaffold. The unit is driven by manually operated crank.



ELEVATOR SCAFFOLD enables workman to "ride" under low beams without dismantling scaffold or leaving his position on top of it. Adjustability to secure any comfortable working position is also one of its many features.

tions. The savings in labor is afforded by elimination of disassembling and reassembling scaffolding each time it is necessary to pass under connecting low-bays.

The frame of the unit is approximately 4 ft by 5 ft by 12 ft, and is constructed of 2-in. by 2-in. by ¼-in. angle iron. In this unit the conventional 4-ft by 5-ft piping scaffold rides up and down by means of steel cables. A manually operated crank built into the base of the structure drives a two-drum hoist. On each corner of the angle iron frame ¼-in. steel cables raise and lower the conventional scaffold by means of a series of pulleys connected to the drive shaft. The unit as a whole can be raised to reach a height of 27 ft. In order that it may be moved about easily, short pieces of 1½-in. conduit are welded into each corner of the frame to receive conventional casters.

The device constructed completely from scrap material and parts has proven its worth many times over. One of its many features is adjustability to secure any comfortable working position.

A mechanic on the scaffold need not leave his post to shift or adjust the unit. Normally, an electrician working at ground level moves, raises or lowers the scaffold on instruction from his "top side" associate. One-man platform control of height adjustment could be attained by motorizing the cable drums and adding a remote control push button.

The telescoping scaffold is also used to lift heavy equipment and material such as transformers, large lighting fixtures, sections of bus duct, etc.

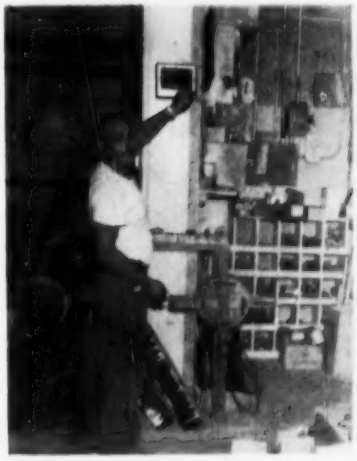
Intercom Increases Efficiency in Office Communication

COMMUNICATION

A contractor installed an intercom system, connecting main office, fixture display area, storeroom and garage. The master control station, which features a built in radio, is located in the office, while remote units are installed in storeroom, garage and display area. Music is played continuously, interrupted only when stations are in use. The system was decided upon to simplify normal office procedures and methods.

John V. Russell, president of Russell Electric Co. Inc., of Bettendorf, Iowa, and his office manager, take care of all phone calls, walk-in inquiries about future wiring, and fixture customers. It is a simple operation when waiting on a customer in the display area, to call the storeroom via the intercom to check if fixture selected is in stock. In order to save time and not leave customer, it is easy to talk to the office to be certain as to date fixture selected might be installed and charges for installation.

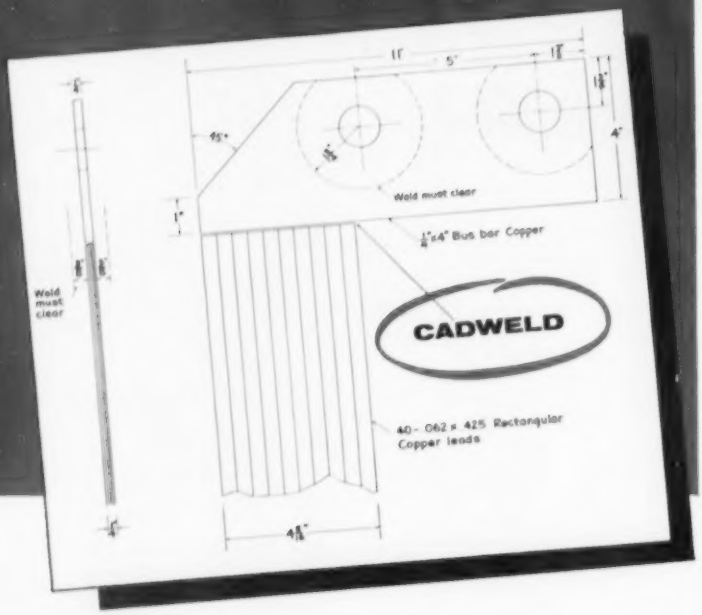
REMOTE UNIT located in fixture display-room, connects with office, storeroom and garage.



STOCKROOM UNIT is used by workmen to inform office of items that are out of stock and needed to be reordered promptly.

just say

CADWELD®



Architects, Engineers and Contractors specify "CADWELD CONNECTIONS" to insure a 100% efficient electrical system for both grounding and power requirements.

CADWELD Field Engineers are located throughout the United States and Canada.

NEW CATALOG available on letterhead request.

CADWELD®

Erico Products, Inc.

2070 E. 61st Place Cleveland 3, Ohio

IN CANADA: ERICO INCORPORATED, 3571 Dundas St., West, Toronto 9, Ontario

MASTER STATION located in office, is operated by Leon Wegner, office manager, to give last minute instructions to electricians leaving for jobs. It features built-in radio that pipes music throughout all areas, interrupted only when stations are in use.

The built in communication system also serves as a visual aid in selling duplicate units to customers for their homes or offices. The installation has proved its worth many times over by speeding telephone calls, and giving last minute instruction or directions to driver delivering materials. It also serves to direct incoming electricians to new job assignments, with little or no loss of time.

Portable Threader Speeds Conduit Work

INSTALLATION

Many hours of hard, tedious labor were avoided during construction of a new hospital at the United States Steel Corporation Homestead District Works through use of the Lawco Jr. portable pipe threader. The tool was used extensively by employees of Sargent Electric Company, Pittsburgh, Pa., electrical contractor on the hospital construction job, for the threading of conduit and as a portable winch.

It weighs 20 pounds and is only 27 in. long. Operation of Lawco Jr. is simple and safe. The operator merely applies the threading die to the tool, places the tool in position on the pipe, then squeezes a trigger switch. The ¾ hp electric motor operates on 110-volt ac or dc to drive the threading dies. The tool is also equipped with a toggle switch to provide reversible power.

In addition to its safety, time-

Built to last a house-time

...the new "T"-rated switch from Bryant

THE NEW BRYANT No. 6001 "T"-RATED WALL SWITCH

For economy plus Bryant dependability, try this switch on your next job. It fills the bill for most residential installations. COMPACT—plenty of wiring room. STRONG—built to last a house-time. HANDY—captive mounting screws make installation easy. SAFE—fully enclosed operating parts. STURDY—large yoke with more exposed plaster-ear area. *Available now at your Bryant Distributor.*

Bryant introduces the newest addition to its complete line of moderately priced wiring devices. It's the new Bryant No. 6001 wall switch. Available with brown or ivory handles . . . single-pole or 3-way.

This new switch gives you the Bryant name . . . Bryant quality at competitive prices. Now—more than ever—you can wisely use Bryant on every job you wire.

Bryant's broad, complete line of wiring devices is designed to meet the specific needs of contractors and electricians on every job. Faster, easier installation . . . highest quality. And Bryant not only meets but exceeds Federal and Underwriter Laboratories Standards. Make Bryant first choice . . . there's no need to change brands or distributors from job to job.

See the new No. 6001 at your Bryant Distributor . . . and the complete Bryant line. J-99993

Complete the job with these quality Bryant devices . . . BUILT TO LAST A HOUSE-TIME

No. 5242, 5262 grounding duplex outlets.

No. 6142 duplex outlet.

No. 9303 three-wire polarized connector.

No. 9306 heavy-duty three-wire polarized connector.

No. 3830 three-wire polarized cord sets.

THE BRYANT ELECTRIC COMPANY
BRIDGEPORT 2, CONN. • CHICAGO • LOS ANGELES

BRYANT
SUPERIOR WIRING DEVICES

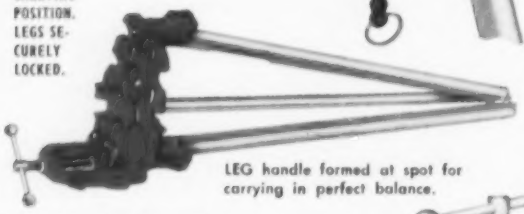
The VISE STAND

THAT *STANDS* FOR SERVICE

COMBINATION DESIGN

Engineered so yoke vise parts (⅛" to 2½") can be replaced by chain vise parts (½" to 4" or vice versa.

CARRYING POSITION. LEGS SECURELY LOCKED.



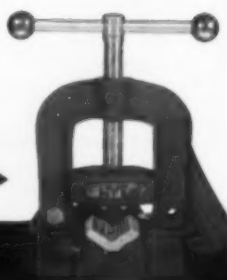
LEG handle formed at spot for carrying in perfect balance.

Stand has double socket benders for ½" and ¾" pipe; and slots for holding tools. 1" tapped hole rear of base to allow extension pipe rest. Also ceiling brace.

SELF-LOCKING VISE

5 NEW PIPE VISES

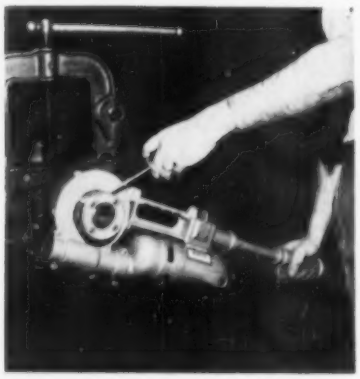
With the ORIGINAL long jaws. Sizes ⅛" to 1½"; ⅛" to 2"; ⅛" to 2½"; ⅛" to 3½"; and ⅛" to 4½". All self-locking, with built-in benders and pipe rest.



NYE TOOL COMPANY

4126 WEST FULLERTON AVE. CHICAGO 39, ILLINOIS

DIFFICULT THREADING of ends of pipes protruding from walls and floors was done quickly and easily with this portable pipe threader on the construction of the hospital building.



REGULAR THREADING operations were handled by the portable power unit, performing most of the tasks formerly assigned to a large threading machine.

saving, and labor-saving features, the Lawco is extremely versatile. Although small in size, it was used on this job to thread conduit as large as 4-in. size.

The tool was also used as a winch to pull overhead feeder cable up to the hospital penthouse, where the main circuit-breaker is located. Without the Lawco, the electricians would have had to place blocks and chains at intervals throughout the building, attaching a line to an outside, truck-mounted winch. Using Lawco they simply ran a rope through the conduit, attached the rope to the three 500 MCM cable, then pulled the cable through, using a square-end rod powered by Lawco. They used a block of wood and an empty paint can to brace the improvised winch, which can hoist objects weighing up to 500 lbs. Of course they could have done the same job by hand. But instead of taking three men only a few minutes, it would have taken six men at least two hours, according to Jack Gray, maintenance foreman for Sargent Electric.

Now you can operate <u>two</u> H-1 400-watt outdoor mercury vapor lamps from a <u>single</u> Sola Constant Wattage Ballast

Operating advantages embodied in the Sola Constant Wattage Mercury Vapor Lamp Transformer have proved so desirable and practical that this type of ballast is fast becoming the generally-accepted standard for mercury vapor lighting installations. Now constant wattage operation plus the economy of two-lamp ballasting is available in a single Sola CW Mercury Vapor Lamp Transformer.

This new design is specifically for two-lamp, outdoor service in commercial and industrial applications of H-1 400-watt mercury vapor lamps. Its famous Constant Wattage Principle of operation offers users the following performance features:

- *Low starting current surge*
- *Regulated lamp wattage and light output*
- *Open circuit protection*
- *Elimination of need for primary taps*
- *No extinguishing on line voltage dips*
- *Extended lamp life*

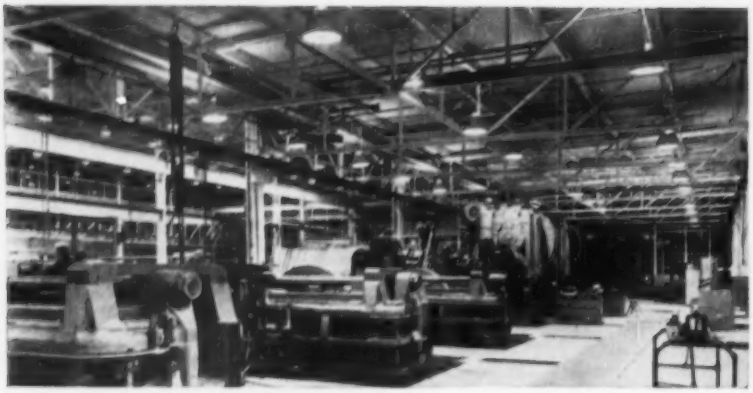
For additional information on your particular application, contact your sales engineer listed below. He's one of a nationwide organization maintained by Sola Electric Co. to provide you with prompt service.

SOLA *Mercury Vapor Lamp* **TRANSFORMERS**

Write for Bulletin 17L-MV-244
SOLA ELECTRIC CO., 4633 W. 16th St., Chicago 50

CONSTANT VOLTAGE TRANSFORMERS • LIGHTING TRANSFORMERS • CONSTANT VOLTAGE DC POWER SUPPLIES
SOLA ELECTRIC CO., 4633 West 16th Street, Chicago 50, Illinois, Bishop 2-1414 • BRANCH OFFICES: Boston, Mass.; Cleveland, Ohio; Kansas City, Mo.; Los Angeles, Calif.; New York, N. Y.; Philadelphia, Pa.; San Francisco, Calif.; Wallingford, Conn. • *Representatives in Other Principal Cities*
Sola Electric (Canada) Ltd., Toronto 17, Ontario: 102 Laird Drive, Mayfair 4554

Low bay...



or high bay...

Improve lighting, reduce eye fatigue with Abolite uplight fixtures

Only a *small* amount of light (18%) is directed upward through the open top of Abolite uplight fixtures, but it makes a *big* difference in both high bay and low bay installations. Dark ceiling shadows are washed away—there's no sharp contrast of bright light against black background. Eye fatigue is reduced—workers are more efficient. Air circulation through the open top fixture sweeps the reflecting surfaces clean, keeps maintenance at a minimum.

There are three Abolite uplight units: 18" and 24" diam. Alzak fixtures for use with 400 and 1000 watt mercury lamps; 18" Alzak fixtures for 500 watt incandescent lamps. For full details, write *Abolite Lighting Division, The Jones Metal Products Co., West Lafayette, Ohio.*

INSTALLATION DATA

Top picture: 24" Abolite Alzak aluminum fixtures with H-400-watt RC1 color-improved mercury lamps. 18' mounting height, spaced 13' 4" by 16' 8". 60 foot-candles average initially.

Bottom picture: 24" Abolite Alzak aluminum fixtures with H-400-RC1 color-improved mercury lamps. 28' mounting height, spaced on 20' centers. 35 foot-candles average initially.

ABOLITE *Lighting*

ESTIMATING FORUM—VI

[FROM PAGE 95]

cost of $18,000. The remaining 110 contracts would be divided into relevant price groups and the normal overhead cost established for each group in a similar manner. The total for all groups would then represent the normal overhead for the 120 contracts amounting to the $840,000 volume.

A further study of Fig. 1 shows that the group price range must be limited for the smaller contracts, but can be extended for the larger amounts. This is due to the rather sharp drop in overhead as the smaller contracts increase in size. To illustrate, pick a few points on the curve and note the corresponding drops in overhead:

$100 to $300—from 40% to 33% (a 7% drop)

$4,000 to $6,000—from 20% to 18% (a 2% drop)

$7,000 to $9,000—from 17% to 15.5% (a 1.5% drop)

$100,000 to $200,000—from 9.5% to 8.75% (a 0.75% drop). This data for the $100,000 contract was taken from the chart on page 136 of Electrical Estimating.

The chart in Fig. 2 is included to help the electrical contractor establish a reasonably complete list of operating cost items for his use when estimating projects or checking experienced costs.

The next article in this series will discuss the three principal factors that affect project overhead costs.

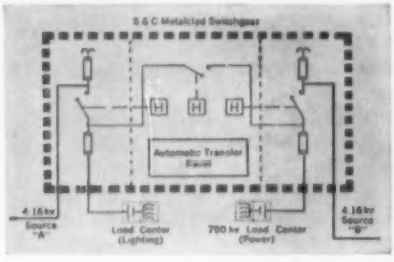
WATCHING shop operation at Giles Armature & Electric Works, Marion, Ill., during inspection of plant prior to the October 10 meeting of the NISA King Coal Chapter. William S. Giles, a NISA past-president (left) and C. H. Lankford, NISA staff engineer.

FOR INDUSTRIAL HIGH-VOLTAGE POWER CIRCUITS —

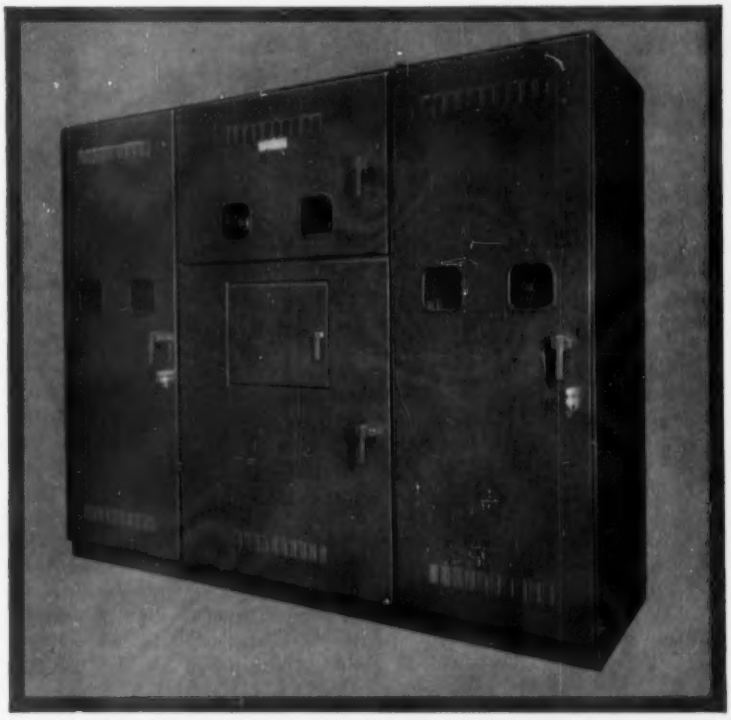
buy the *right* protection in your switchgear—buy S&C Metalclad Switchgear—*Save 50%*

Industrial circuits do not have transient faults. They cannot be re-energized immediately after an outage.

Hence costly circuit breakers are unnecessary. S&C Power Fuses give the right protection.


S & C Metalclad Switchgear
Automatic Transfer Panel
4.16 kv Source "A"
Load Center (Lighting)
750 kv Load Center (Power)
4.16 kv Source "B"

Source A normally supplies the Lighting Load, and Source B normally supplies the Power Load. In case of power failure of either source, the S&C Standard Automatic Transfer Panel (located in the center bay) goes into action. It causes the S&C Moto-Draulic Operators [H] to actuate the "source" and "tie" load interrupters transferring both loads to the live source, insuring service continuity.



S&C Metalclad Switchgear with automatic transfer installed in the Methodist Hospital, Indianapolis, Indiana. Architect: D. A. Bohlen & Son; Consulting Electrical Engineer: Ammerman-Davis & Stout Co.; Electrical Contractor: Watson-Flagg Engineering Co. One of two such units, this switching center serves the hospital's Main and Center Wings. A similar unit serves another building.

For industrial, commercial, and institutional high-voltage power circuits, conductors run in cables or conduits. They are not exposed to lightning, falling trees, rodents, wind, or ice which typically cause transient faults.

Consequently, the only faults that occur are permanent faults and S&C Power Fuses give the right protection against them. The quick reclosing feature of expensive circuit breakers is of no value here. S&C Metalclad Switchgear—by using S&C Power Fuses rather than circuit breakers, and by incorporating load interrupters for full load switching—brings substantial savings in switchgear costs—sometimes as much as 50%.

S&C Electric Company, 4433 Ravenswood Ave., Chicago 40, Ill. In Canada: S&C Electric Canada, Ltd., 8 Vansco Road, Toronto 14, Ontario.

S&C ELECTRIC COMPANY

BUILDING

WIRE

IF IT CARRIES CURRENT, KW CARRIES IT!

USE OF KW ALUMINUM CONDUCTORS SAVES 25% OF TOTAL COST IN FARM REWIRING JOB!

A rewiring project recently completed for "Cattle Gate Farm" at Shabbona, Illinois demonstrates how REAs and CO-OPs can help farmers make big savings on materials by using KW Aluminum Conductors.

Cattle Gate Farm's cash saving of more than $250 was realized entirely on materials—by using aluminum wire instead of copper. *Yet this material saving alone accounted for a 25 per cent saving in the total job cost.* There's proof that aluminum makes a really big difference!

The project included new wiring for new buildings plus rewiring of out-dated copper services. And besides the savings, the new aluminum system added the extra benefits of increased power distribution, a more functional farm wiring system, cleaner over-all operational roadways . . . and room for additional power expansion as electrical needs grow!

Local Contractor Did Complete Job

The aluminum installation was quick and trouble-free, according to Mr. Carl Sandberg, local DeKalb County electrical contractor who did all of the new wiring in the aluminum cattle barns, hog sheds and equipment buildings.

"It was just as easy as working with copper once we got into the habit of the few minor differences you have to remember when working with aluminum wire instead of copper," said Sandberg. An additional advantage he noted was the absence of fatigue after working with the lightweight aluminum conductor.

Mr. Sandberg worked with the local utility in replacing the old, inadequate copper services from the main distribution transformer to the two residences on Cattle Gate Farm.

New Farm Wiring Bulletin Available

The new Kaiser Aluminum Farm Wiring Bulletin No. 710 presents the latest techniques for farm wiring installation, plus details of availabilities and cost for all types of aluminum conductor. This new bulletin is ideal for use by REAs, CO-OPs, and Utilities in explaining the advantages of aluminum wiring to the farming markets.

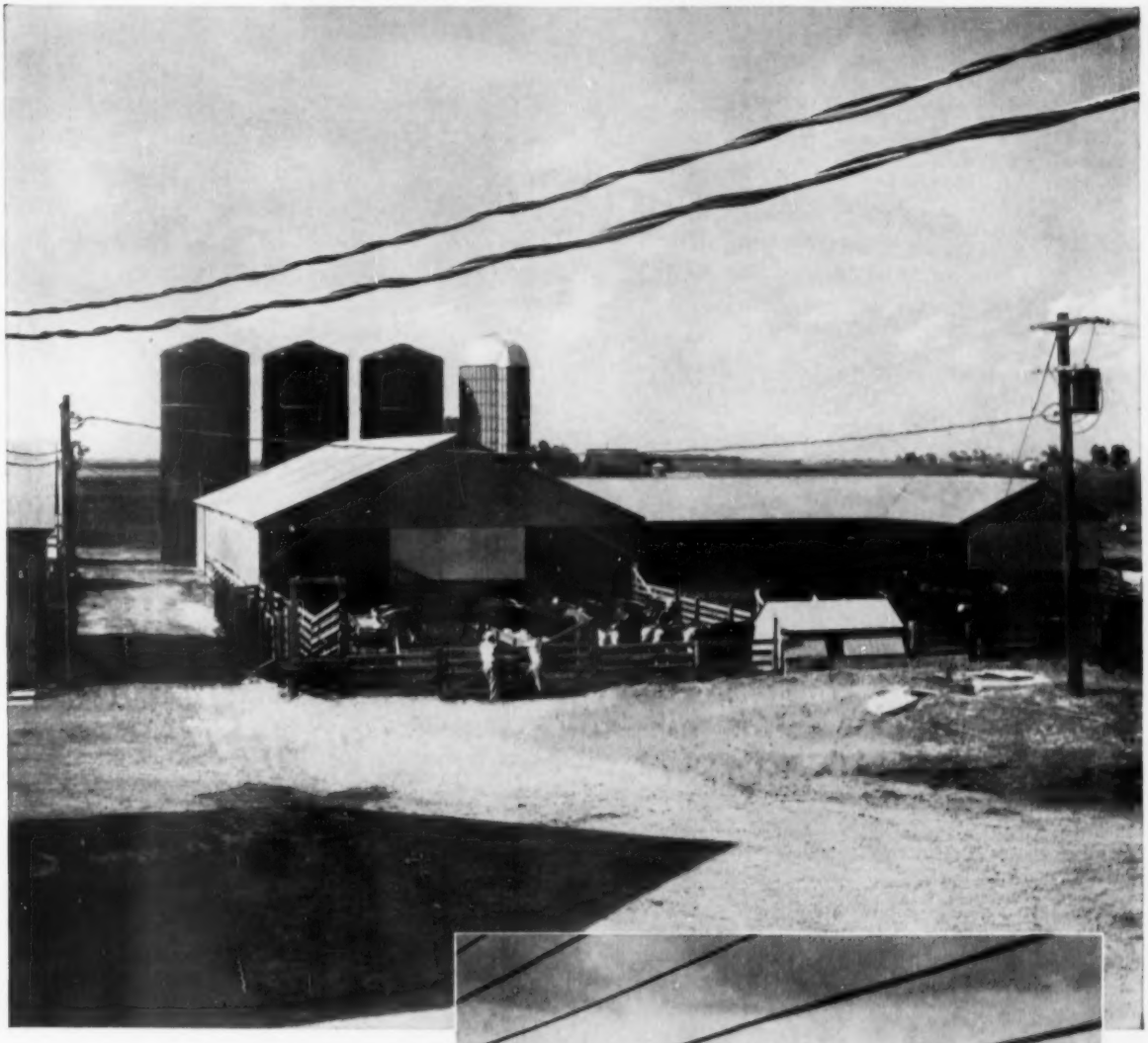
Free copies of this bulletin are available on request. Contact the Kaiser Aluminum sales office or the KW distributor listed in your telephone directory, or write Kaiser Aluminum & Chemical Sales, Inc., 919 North Michigan Ave., Chicago 11, Illinois.

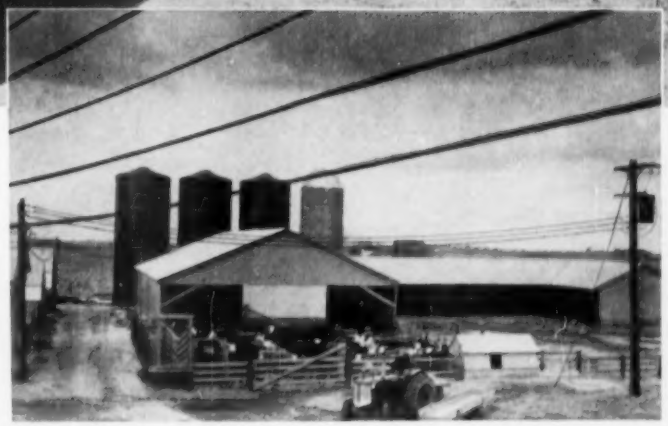
Kaiser Aluminum & Chemical Sales, Inc., *Executive Office*, Kaiser Bldg., Oakland 12, Calif.; *General Sales Office*, Palmolive Bldg., Chicago 11, Illinois.

Local Utility supplied transformer pole right on farm, changing primary service drop from copper weatherproof to KW Aluminum Triplex. New, larger size aluminum system is designed to carry more current as power load grows.

Mr. Smalley checks proper listing of all electrical circuits at each switch box. This "Farm Better Electrically" habit assures accuracy in locating system trouble in an emergency and helps in planning electric loads.

Putting electrical power to work, Mr. Smalley uses his new electrically powered aluminum elevator in getting feed to the cattle herd from the silos. Supervision is supplied by the Kenneth Johnson children.





James B. Smalley's Cattle Gate Farm, shown above after completion of rewiring project, now enjoys the advantages of KW conductors especially suited to each application . . . including Triplex, SEU, Underground, Type TW Building Wire and Aluminum Conduits. Notice the cleaner farm appearance and increased serviceability of farm roadways (as compared to previous low-hanging copper services shown at right).

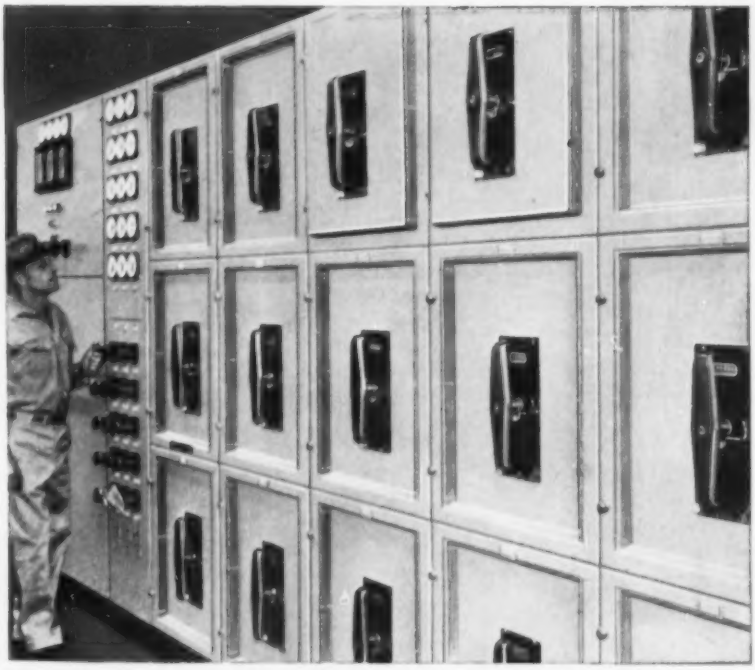
KAISER Aluminum

THE BRIGHT STAR OF METALS

ALLIS-CHALMERS

low voltage

switchgear



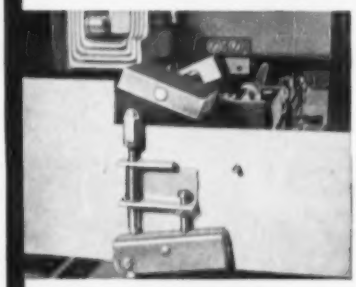
"Out in Front"

IN every way, this is outstanding switchgear. Whether it's the sleek-looking, two-tone outdoor gear with the inner service aisle . . . or the neat, compact indoor gear, you get the latest in features, design and construction.

Check these features... then...

Get complete details. Call your nearby Allis-Chalmers office or write to Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

"Out in Front" with the contoured door panel that provides exclusive breaker storage inside cubicle.



Panel is shown in its reversed or protruding position to provide additional space in the closed cubicle when breaker is in test or disconnected position.

Safety first! Positive mechanical trip interlock automatically trips the breaker if anyone tries to move it in or out of the operating position while breaker is closed. Note also that breaker operation can be checked in test position with door closed or open.

Extra convenience. Movable primary and secondary disconnects are easily inspected through large cut-out on each side of breaker mounting frame. It's not necessary to remove breaker from mounting for this inspection.

A-5418

ALLIS-CHALMERS

FOR MORE INFORMATION ON

NEW PRODUCTS
CATALOGS, BULLETINS
ADVERTISEMENTS

USE THESE CARDS

- **PRODUCT NEWS, PRODUCT BRIEFS:**

  Use first line of boxes. Insert item numbers of products on which more information is desired.

- **CATALOGS, BULLETINS AND ENGINEERING DATA:**

  Use second line of boxes. Insert item numbers of literature desired.

- **ADVERTISEMENTS:**

  Use third line of boxes. Insert page numbers of advertisements on which additional information is desired. Where more than one advertisement appears on the page, include the manufacturer's initials.

IMPORTANT...

- PLEASE PRINT LEGIBLY
- USE BLACK OR DARK BLUE INK
- DO NOT USE PENCIL OR RUBBER STAMP

Please send me without obligation further information about the following: 12-57

Product News and Product Briefs, Item Number

Catalogs and Bulletins, Item Number

Advertisement on Page

NAME ..... TITLE .....

COMPANY .....

ADDRESS .....

.....

ELECTRICAL CONSTRUCTION AND MAINTENANCE — A McGraw-Hill Publication

NOT GOOD AFTER FEBRUARY 1, 1958

Please send me without obligation further information about the following: 12-57

Product News and Product Briefs, Item Number

Catalogs and Bulletins, Item Number

Advertisement on Page

NAME ..... TITLE .....

COMPANY .....

ADDRESS .....

.....

ELECTRICAL CONSTRUCTION AND MAINTENANCE — A McGraw-Hill Publication

NOT GOOD AFTER FEBRUARY 1, 1958

Your Name and address will be reproduced and sent to the appropriate manufacturers. Illegible or incomplete addresses may result in your not receiving the information you desire.

PLACE 3¢
STAMP
HERE

The Editor
ELECTRICAL CONSTRUCTION AND MAINTENANCE
330 West 42nd St.,
New York 36, N. Y.

PLACE 3¢
STAMP
HERE

The Editor
ELECTRICAL CONSTRUCTION AND MAINTENANCE
330 West 42nd St.,
New York 36, N. Y.

Your Name and address will be reproduced and sent to the appropriate manufacturers. Illegible or incomplete addresses may result in your not receiving the information you desire.

FOR MORE INFORMATION ON

NEW PRODUCTS
CATALOGS, BULLETINS
ADVERTISEMENTS

USE THESE CARDS

- **PRODUCT NEWS, PRODUCT BRIEFS:**

  Use first line of boxes. Insert item numbers of products on which more information is desired.

- **CATALOGS, BULLETINS AND ENGINEERING DATA:**

  Use second line of boxes. Insert item numbers of literature desired.

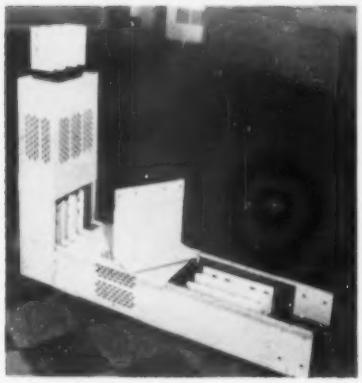
- **ADVERTISEMENTS:**

  Use third line of boxes. Insert page numbers of advertisements on which additional information is desired. Where more than one advertisement appears on the page, include the manufacturer's initials.

IMPORTANT...

- PLEASE PRINT LEGIBLY
- USE BLACK OR DARK BLUE INK
- DO NOT USE PENCIL OR RUBBER STAMP

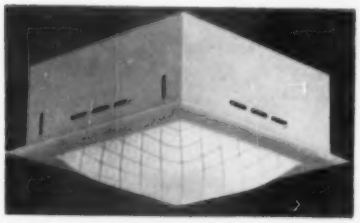
Product News



Bus Ducts (1)

Improved design low impedance feeder and plug-in bus ducts supplied with totally enclosed, ventilated or weatherproof housings have been announced. Design of bus ducts permits assembly of tees and elbow during installation to meet particular user needs. Self-supporting bus bars are secured in place on 11-in. centers by means of bolted phenolic blocks. Bus bars are arranged with integral plug-nuts at one end and slotted holes at other. Extra slotted holes and plug nuts are provided at each joint to facilitate on-location assembly of tee at splice between standard 10-ft duct sections. Heavy current take-off devices can be bolted on bus at any time without disturbing splice between installed sections. Listed by UL, bus duct is available in ratings of 600, 800, 1000, 1350, 1600, 2000, 2500, 3000 and 4000 amps.

Federal Pacific Electric Co., 888 North Keyser Ave., Scranton, Pa.



Lighting Fixtures (2)

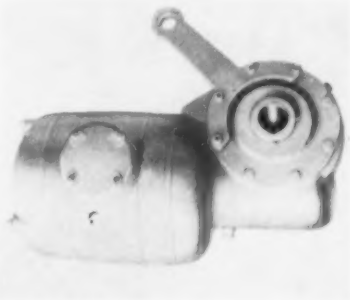
A new selection of square 100-watt recessed lighting fixtures with one-piece steel frames has been added to the Atlite lighting equipment line. Each unit is offered in any of three styles of housings; unwired, unwired with an asbestos lining, and prewired. All units are equipped with fibre glass gaskets to eliminate light leakage. Units are available in a number of different finishes and lens styles. Finishes include chrome, copper and brass plate, grey and white paint, and satin black anodized and satin aluminum anodized. Lens styles include Skytex, fresnel, Ferlux, Alba, drop lens and bent lenses.

Atlas Electric Product Co., 319 Ten Eyck St., Brooklyn 6, N. Y.

Fluorescent Lamp (3)

New fluorescent lamp called the "Super-Hi". The units exploit a mixed gas principle which permits both long cathode life and high brightness. Lamps are identical in size to conventional T-12 lamps. Cooling chambers located at each end of lamp and use of continuous filament heating permit new lamps to have excellent starting and operating characteristics. Available in 48-, 72- and 96-in. sizes, the lamps are rated at 6000, 9300, 13000 initial lumens respectively. Initially available in cool white, they have recessed double-contact bases. Lamps can be used in industrial and outdoor lighting applications.

Westinghouse Electric Corp., Box 2278, Pittsburgh, Pa.



Gear Motors (4)

A new line of shaft mounted right angle gear motors from ¼ through 5 hp especially suitable for lighter pieces of machinery or use in small areas. Gear motor is built for continuous duty and meets all AGMA specifications.

Sterling Electric Motors, Inc., 5401 Telegraph Road, Los Angeles 22, Calif.

Enclosure (5)

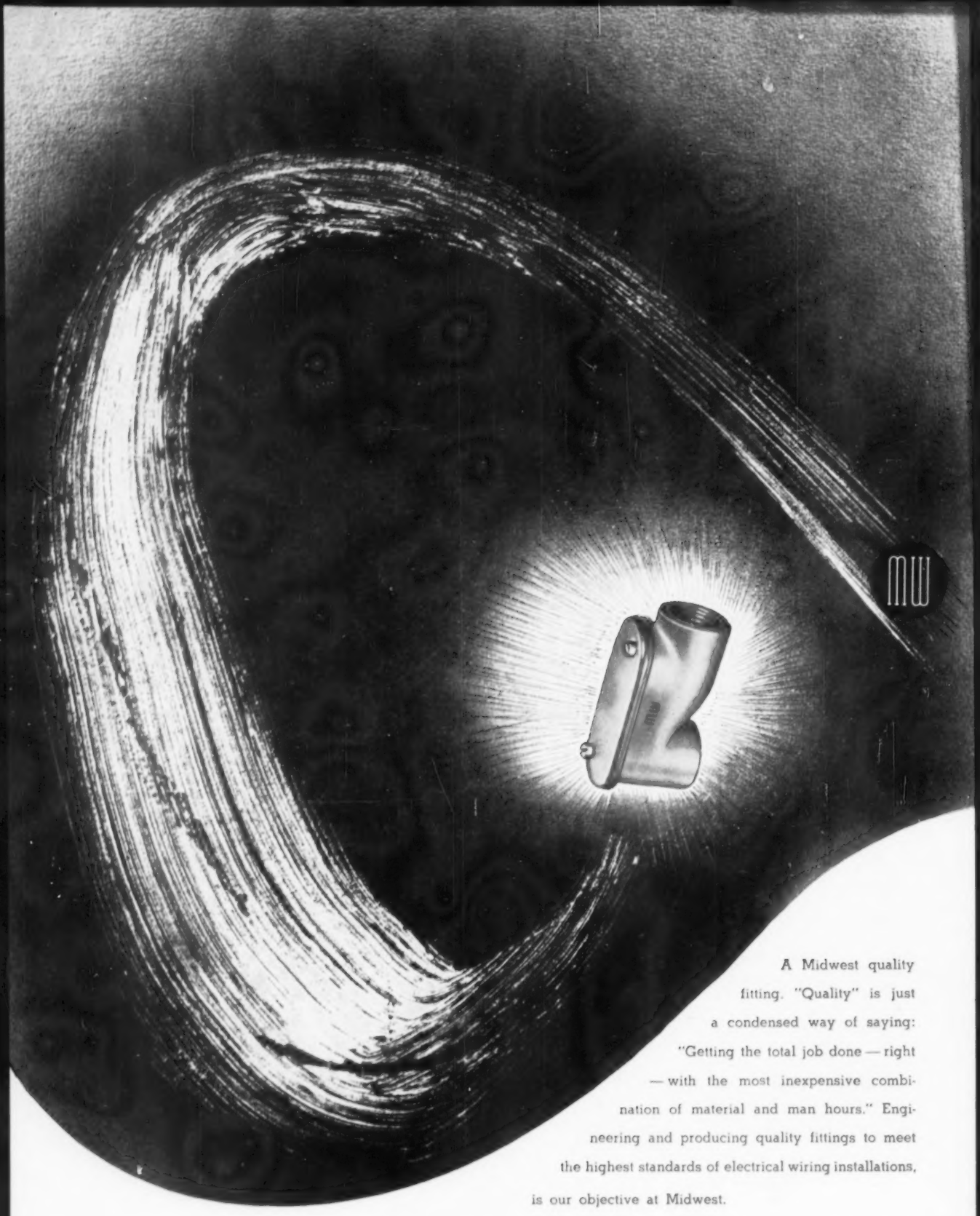
New 100-amp raintight, split bus, enclosure is designed to accommodate the "E-Z-Red" circuit breaker 15- to 50-amp single or double pole. It is for 3-wire service, solid neutral, 120/240 volts ac. Service busbars will take four double poles, three of the double poles can be used for any three of the following: dryer, range, water heater, heating panels, air conditioners, etc. The remaining double pole controls eight single pole branch circuits. With sequence bus design any two adjacent breaker positions may be double pole. Door is the new sliding hinge type of construction which permits accessibility to the interior for wiring or for operation of device. Door may be sealed or padlocked. It is listed by UL.

Wadsworth Electric Mfg. Co., Inc., Covington, Ky.

Connectors (6)

A new line of aluminum power connectors for tubing to tubing, cable to cable, tubing to cable or terminal lug connections, etc. Some of the features are: positive gripping action; positive wrapping action; designed to carry full rated current of conductors with temperature rise of connector not exceeding that of conductor; edges and ends of connectors are rounded; recessed bolt heads for single-wrench assembly and disassembly.

Delta-Star Electric Div., H. K. Porter Co., Inc., 2437 Fulton St., Chicago 12, Ill.



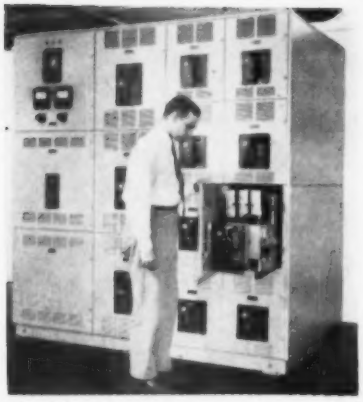
A Midwest quality fitting. "Quality" is just a condensed way of saying: "Getting the total job done — right — with the most inexpensive combination of material and man hours." Engineering and producing quality fittings to meet the highest standards of electrical wiring installations, is our objective at Midwest.

Midwest Electric Mfg. Company

MANUFACTURERS OF ELECTRICAL WIRING PRODUCTS

1639 W. WALNUT STREET

Chicago 12, Illinois

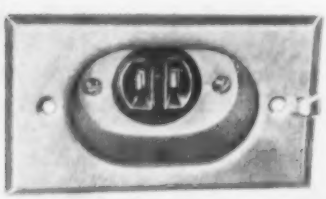


Circuit Breakers (7)

Complete re-design of its low-voltage power circuit breakers and of the switchgear that makes use of them has been announced. The new K-line circuit breakers—600-volt units in 225-, 600-, and 1600-amp frame sizes—have quick-make manual closure of breaker contacts. Also have a new motor-driven stored-energy system for electric breaker closure, interchangeable overload trips and increased accessibility to trips and other breaker parts. Reduction in breaker size permits four-high stacking of 600-amp breakers in standard 90-in. high enclosures.

Units are designed for commercial building, industrial plant and power station applications—for the switching, control and protection of motors, generators, transformers, feeder circuits and other large electrically-powered equipment. The new line of low voltage power circuit breakers, in addition to the K-225, K-600, K-1600 models, also includes model KD, a 3000-amp rating, and the KE, a 4000-amp frame size.

Switchgear Div., I-T-E Circuit Breaker Co., Philadelphia, Pa.



Clock Hanger Outlet (8)

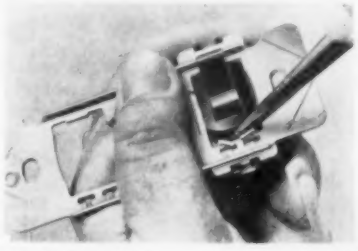
A complete line of clock hanger outlets are combination wiring devices equipped with support hooks and ac outlets. They have recessed receptacles which permit clocks to hang flat and conceal the wiring. Outlet comes in a number of tarnish-proof, vacuum-metallized finishes which include: spray brass, brown crackle, chrome steel, stainless steel, ivory alloy, ivory crackle and white alloy. U. L. approved.

Perfect-Line Mfg. Corp., Old Country Rd. & RR Ave., Hicksville, L. I., N. Y.

Insulation (9)

A new elastic and heat-resistant Isocyanate insulating material, Isolastane, is now available. Suitable for continuous-duty operation at temperatures up to about 150°C, Isolastane is available in bias glass cloth and tape and glass woven sleeving forms.

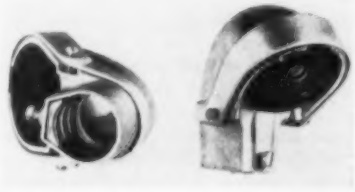
Natvar Corporation, Woodbridge, N. J.



Wiring Devices (10)

A new line of interchangeable wiring devices. The line includes outlets, ac switches, ac/dc T-rated switches, and pilot lights; in brown and ivory, with easy to wire pressure-lock terminals. Dual terminals that permit looping and extra common terminals give users more flexibility in wiring.

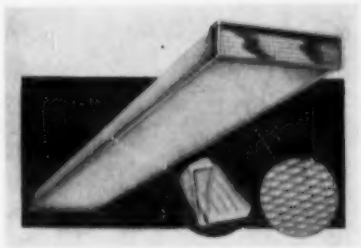
General Electric Co., Providence, R. I.



Entrance Fittings (11)

New Griptite entrance fittings permit conduit to be slipped into the fitting easily and without threading. Only a screwdriver is needed to tighten the inner shoe on conduit or tube. Fittings are made of malleable iron, hot dipped galvanized. They are available in sizes from ½-in. to 2-in.

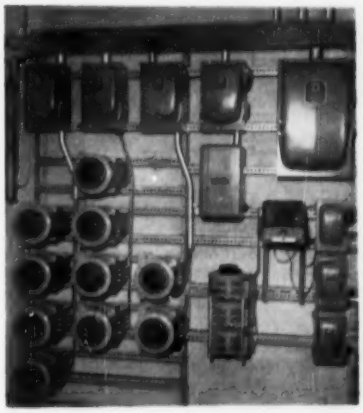
Gedney Electric Co., 1250 Avenue of the Americas, New York, N. Y.



Lighting Fixture (12)

Commercial lighting fixture, called the "Catalina", was developed specifically to compliment modern building trends. It can be installed in continuous lines through the use of extruded polystyrene plastic side panels, chemically fused to a new 45° by 45° plastic louver to form one unit. Available for two or four lamps in 4- and 8-ft units, the Catalina has a 55% upward light component when suspended and is available with top reflectors for surface mounting. Literature is available.

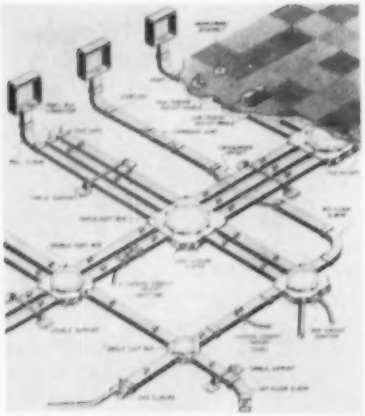
Benjamin Electric Mfg. Co., Des Plaines, Ill.



Slotted Angle (13)

Framework, support and troughs for conduit, cable, switchgear and controls can be constructed quickly with the use of slotted angle, all-purpose framing material made of cold-rolled steel with an electro-galvanized finish. Steel Dexion slotted angle is designed as a self-measuring material with a pattern of slots and holes which is repeated at 3-in. intervals. Material is reusable and its galvanized finish resists wear under adverse atmospheric conditions. Made in 10- and 12-ft lengths, slotted angle is available in packages containing ten lengths, complete with nuts and bolts.

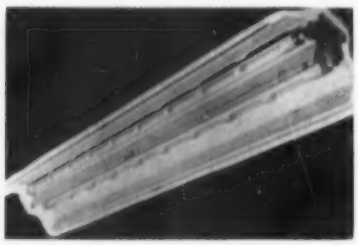
Acme Steel Co., 135th St. & Perry Ave., Chicago 27, Ill.



Distribution System (14)

A new single-level steel underfloor distribution system has been developed for use in commercial, industrial, and institutional buildings where shallow-floor fills are used, or where cost is a determining factor. It is listed by UL for installation in slab and fill or monolithic types of floor construction and can be installed in floor fills as thin as 2½ in. Electrical distribution and feeding are accomplished on one level. Single-, double- and triple-duct boxes are used, depending on number of separate services required. Cross-sectional dimensions of duct are 1-7/15 in. by 2¼ in. with round corners giving a cross-section capacity of 3.357 sq in. Duct and fittings can be worked into any conventional layout with special adaptation.

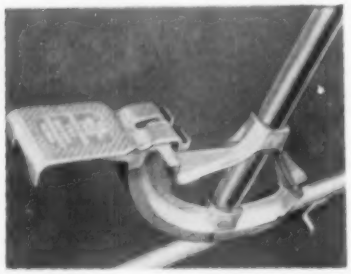
Conduit Products Dept., General Electric Co., Bridgeport, Conn.



Fixtures (15)

Two new fluorescent fixtures, Power-Lume F and Power-Lume V, specifically designed to utilize the extra illuminating power of the new Power Groove lamp. They are designed for all medium to high mounting applications. Power-Lume F fixture is for use where rough work is being performed and shielding is unimportant. Where reduced brightness is required, the same fixture with aluminum reflector is recommended. For areas where more difficult seeing tasks are being performed, the new Power-Lume V unit with drawn one-piece porcelain reflectors and increased shielding is recommended. Data Sheet 100D is available.

Wheeler Reflector Co., 275 Congress St., Boston 10, Mass.



Benders (16)

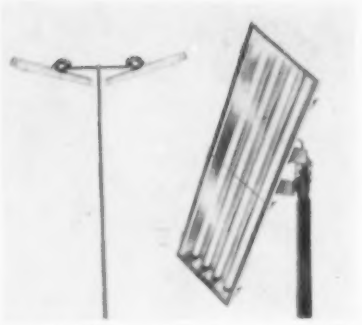
PJ100 is the latest addition to the "Powr Jack" line of portable "Redege" Benfield benders for "on the job" bending of electrical conduit. It is designed to bend ¾-in. Sherarduct and other types of rigid steel conduit, as well as 1-in. Xduct Junior metallic tubing. The two-position foot treadle booster step provides the means for constant, heavy foot leverage.

National Electric Products Corporation, Gateway Center, Pittsburgh, Pa.

Temperature Control (17)

The D95, an explosion-proof remote bulb temperature control, with micrometer adjustment, is designed to control temperatures over wide ranges in hazardous locations where explosive vapors or gases are present. Unit is composed of two integral assemblies: a remote bulb thermal device and control head with connecting capillary tube of varying lengths. Thermal systems consist of a bulb, capillary tube and bellows filled with temperature sensitive liquid. Unit has a cast iron enclosure, which also permits the use of this control in Class I, Group C and D locations. Switches are available in any one of three standard types: normally open, normally closed or double throw with no neutral position and are rated for 15 amps at 115 or 230 volts ac. All switches are single pole and suitable for 180° F. ambient temperatures.

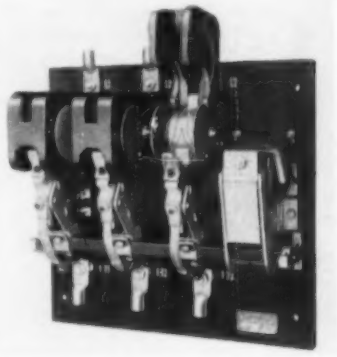
United Electric Controls Company, 79 School St., Watertown 72, Mass.



Floodlight (18)

A new, high mounting fluorescent floodlight designed especially to illuminate service station entrance-ways, perimeter areas, and service areas. Each floodlight uses four 72-in. high output rapid start fluorescent lamps having a 1000 ma rating. Housing is available with clear safety glass doors, plastic doors, or without doors. Housing is finished in white baked enamel, applied over a vinyl wash primer and grey prime coat. Mounting yoke can be adjusted to position floodlight horizontally, or at various angles to 45° as desired. Floodlight may be mounted singly or in pairs.

Revere Electric Mfg. Co., 6009 Broadway, Chicago 40, Ill.



Magnetic Contactor (19)

A new Bulletin 5005, Size 5, 300-amp, ac magnetic contactor features blowout system. The arc-centering feature assures more efficient arc interruption and longer arc-shield life. Another feature is single armature adjustment. Frame and all structural members are stamped steel with welded joints. Bearings are self-lubricating, porous bronze. Shunts are stranded copper. Oversize stationary and moving copper contacts are identical and interchangeable. Contact springs are stainless steel.

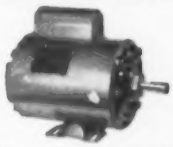
Euclid Electric & Mfg. Co., Madison, Ohio.

Reduce Down Time—Power your Equipment with *Dependable* Wagner Motors

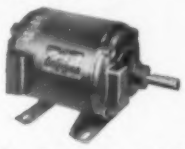
Sixty-six years of experience goes into the building of Wagner Motors. Their reputation for reliability, their electrical characteristics, price and prompt delivery make them a sound choice for your equipment.

Whatever your motor requirements may be—single-phase or polyphase... ⅛ or 500 horsepower—Wagner can offer a standard motor that is entirely dependable in its specific application. A few of the many motors in the Wagner line are shown below.

FRACTIONAL HP



TYPE RK — Capacitor-start Induction. For general purpose applications. Single-phase. Rigid or resilient mounting. 48 frame: ¼ or ¼ hp. 56 frame: ⅓ through ¾ hp. Also available in integral ratings through 5 hp.



TYPE RA — Repulsion-start Induction. For general purpose applications. Single-phase. High starting torque—low starting current. ¼ through ¾ hp. Also available in integral ratings through 15 hp.

TYPE RB — Split-phase Induction. For easy starting applications. Single-phase, resilient mounting. 48 frame: ⅛, ¼ or ⅓ hp.

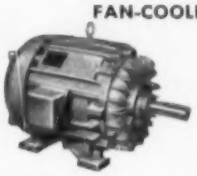
TYPE RP — Polyphase Squirrel-cage Induction. General purpose, normal torque. 56 frame: ¼ through ¾ hp.

INTEGRAL HP

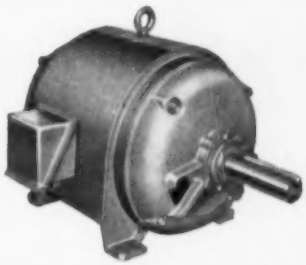
DRIP-PROOF

TYPE DP—Squirrel-cage Induction, corrosion resistant cast iron frames. 1 through 125 horsepower.

TOTALLY ENCLOSED FAN-COOLED



TYPES EP AND JP Standard and explosion-proof. Squirrel-cage Induction, corrosion resistant cast iron ribbed frames, 1 through 30 hp—smooth frames, 40 through 250 hp.



OPEN TYPE POLYPHASE SQUIRREL CAGE

TYPE RP—Drip-proof. Suitable for all general purpose applications. Available in ratings 150 through 500 hp.

OTHER WAGNER MOTORS

In addition to a complete line of standard motors, Wagner also furnishes Increment Type Motor and Starter Combinations... Wound Rotor Polyphase Motors... Jet Pump Motors... Vertical and Flange Mounted Motors... Hermetic Motors... Gear Motors and Direct-Current Motors. Consult the nearest of our 32 branch offices, or mail coupon today for full information on the complete Wagner line.

M57-10A

Wagner Electric Corporation
6413 Plymouth Ave., St. Louis 14, Mo.

Please send Bulletin MU-185 on your complete line of Motors.

NAME_____

POSITION_____

COMPANY_____

ADDRESS_____

CITY & STATE_____

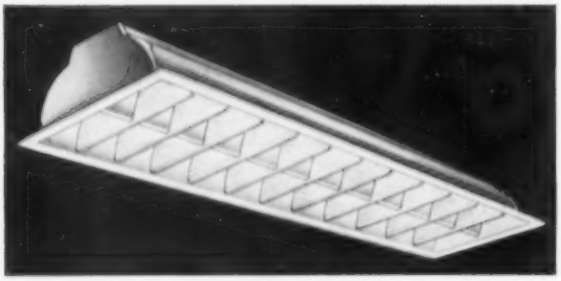
New Day-Brite Mobilex®

Introducing a new Mobilex for modular ceilings. Available in five different fixture types . . . pioneered by Day-Brite . . . compatible with 97 different ceiling systems. Two inches shallower . . . stronger, yet one-third lighter . . . new Mobilex is faster, safer, easier to install.

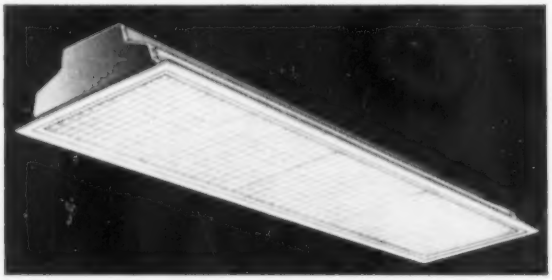
New Low Price . . . plus low installation and maintenance costs. You can install additional fixtures later—inexpensively—because Mobilex is interchangeable with acoustical ceiling panels. Mount end to end or side by side. 2-foot, 4-foot or fill-in sections. Two, three or four lamps.

Call your Day-Brite representative for a demonstration today! He's listed in the Yellow Pages.

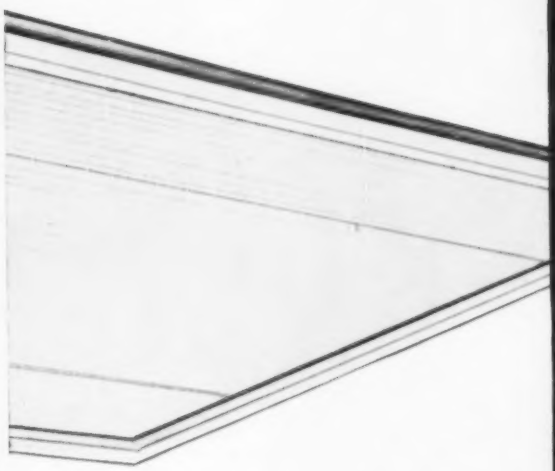
New Day-Brite Troffers...new low prices!



ALZAK PARALOUVER—Exclusive, patented aluminum Paralouvers® reduce lengthwise brightness by 50% without lowering efficiency of the fixture. Available in 4-foot, 8-foot and fill-in sections for all plaster and acoustical ceilings. Two Rapid-Start or Slimline lamps.



WAFFLETEX® PLASTIC—High light transmission with low brightness. New lightweight Waffletex enclosure hinges from either side for easy maintenance. Supplied as 4-foot, 8-foot or fill-in sections for all plaster and acoustical ceilings. Two or three Rapid-Start or Slimline lamps.



Mr. Arthur St. Arnaud, President, and Mr. Don Douglas, Engineer, St. Arnaud Electric Co., East Chicago, Indiana

"Carefully compared... unanimously chose Day-Brite"

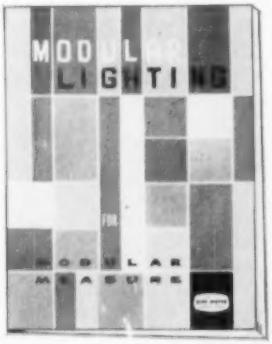
"On a recent highly diversified lighting job, we carefully compared fixtures from fifteen of the lighting industry's top manufacturers . . . and unanimously chose Day-Brite," says Mr. Don Douglas.

"Day-Brite was far easier to unpack, assemble and install than other fixtures . . . and of course that means dollar-savings for us. We found Day-Brite's functional design and maintenance features also excellent in every respect. These two items are vitally important to the building owner.

"I'd like to commend Day-Brite's lighting engineer, too. He followed the job through from the beginning. His help was of tremendous value."

Special features include:

- *Greater strength and rigidity*
- *Improved reflector shape*
- *Fixture takes less ceiling space*
- *Glass, plastic or louvered enclosures*
- *Rust-inhibited enamel on metal parts*



FREE! New illustrated booklet on Day-Brite Mobilex and Troffers.

Certified Lighting for a Better America

71171

DECIDEDLY BETTER
DAY-BRITE
Lighting Fixtures

CLIP AND MAIL TO:

Day-Brite Lighting, Inc.
5402 Bulwer Ave.
St. Louis 7, Missouri

Please send _____ copies of Day-Brite's new illustrated booklet on the Day-Brite Modular Method.

NAME _____

COMPANY _____

ADDRESS _____

CITY _____ *STATE* _____

NATION'S LARGEST MANUFACTURER OF COMMERCIAL AND INDUSTRIAL LIGHTING EQUIPMENT

NEW

KLEIN

CATALOG
FOR
- LINEMEN
- ELECTRICIANS
- INDUSTRY

100 years ago in 1857, Mathias Klein opened a little forge shop in Chicago. Out of this has grown the national institution known as Mathias Klein & Sons.

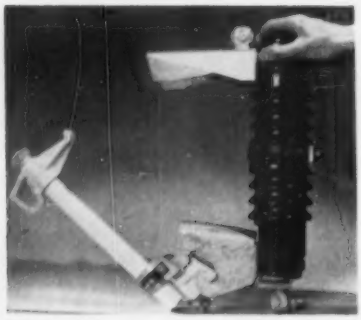
To dramatize this 100 years of service to industry, Klein has prepared a completely new catalog.

It contains illustrations and descriptions of the wide range of pliers, grips, climbers, belts, safety straps—the tools and equipment needed by linemen, electricians and industry.

A new feature is a section giving the dimensions of each plier—length of handle, length of cutting knives, width of head, size of point, etc.

This Klein Catalog No. 100 will be of interest to linemen—electricians—good workmen everywhere. A copy should be in the hands of every purchaser of good tools. Write for yours.

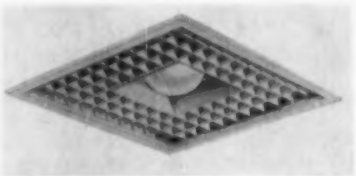
Mathias Klein & Sons
7200 McCORMICK ROAD • CHICAGO 45, ILLINOIS



Cutout **(20)**

A new extra heavy-duty load-break cutout, Type DX, is available in ratings of 5.2 and 7.8 kv, with fault interruption capacity of 10,000 amps. At a 15-kv rating, the interrupting capacity is 8000 amps. The new fuse tube is interchangeable in the same fuse holder mounting with the standard and heavy-duty models of the same rating. Cutout also has a double-vented feature, containing an expendable cap at the top, which melts when pressures inside are too high to escape through the regular aperture.

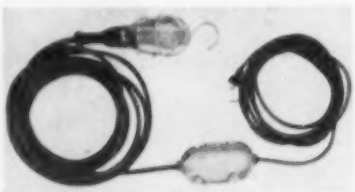
Westinghouse Electric Co., P. O. Box 2099, Pittsburgh 90, Pa.



Lighting Fixture **(21)**

A new recessed lighting fixture for gymnasiums. It is UL approved for use with up to 500-watt lamps. Unit may be relamped from the floor with a pole type lamp changer. Construction is 1-piece louver and face frame to withstand impact. It is for high gymnasium ceilings and other multi-purpose auditoriums.

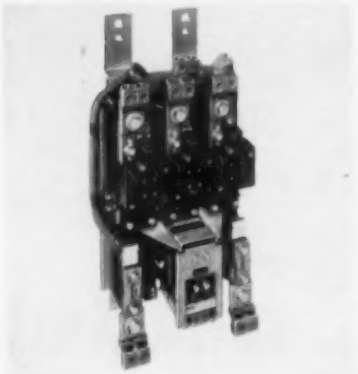
Neo-Ray Products, Inc., 315 East 22d St., New York 10, N. Y.



Safety Drop Cord **22)**

A new safety drop cord provides a 12-volt 100-watt outlet from the line voltage and is said to eliminate the hazards of electrical shock. A built-in transformer with a waterproof sealed housing is claimed to be the principal feature. A total of 50 ft of oil-resistant wire makes up the cord's length, 20 ft leading into the transformer and 30 ft coming out of the secondary. A vapor proof lamp guard is available for use with the cord.

Sittler Corporation, 18 N. Ada St., Chicago 7, Ill.



Starter **(23)**

A new compact vertical action Size 5 starter requires only 270 sq in. of space. The coil, contacts and overload relays can be easily changed without disturbing external connections. Up to four extra interlocks can be added in addition to the holding circuit interlock. Pushbutton and selector switch kits are available for addition to the new Size 5 in general purpose enclosure.

Square D Company, 5051 N. Richards St., Milwaukee 12, Wis.

Photoelectric Heads **(24)**

For convenient positioning, particularly in limited or hard-to-reach space, small phototube and light source heads have been developed. Housed in $1\frac{7}{8}$ by $1\frac{3}{4}$ by $3\frac{3}{8}$-in. gasket sealed cast aluminum cases, the small heads screw on to $\frac{1}{2}$-in. pipe or conduit for both support and wiring which simplifies rigid mounting in practically any position or location. Heads are also available with 6-ft flexible armored cables. Light source head has a straight fixed light beam rated from 30 footcandles at 5 ft to 2 footcandles at 14 ft. Also available with fixed focus pin point light beam. Literature is available.

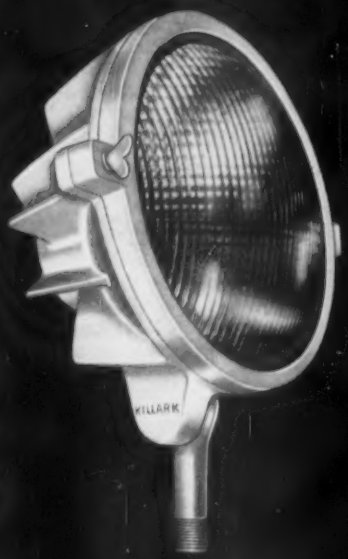
Autotron, Inc., Danville, Ill.

KILLARK

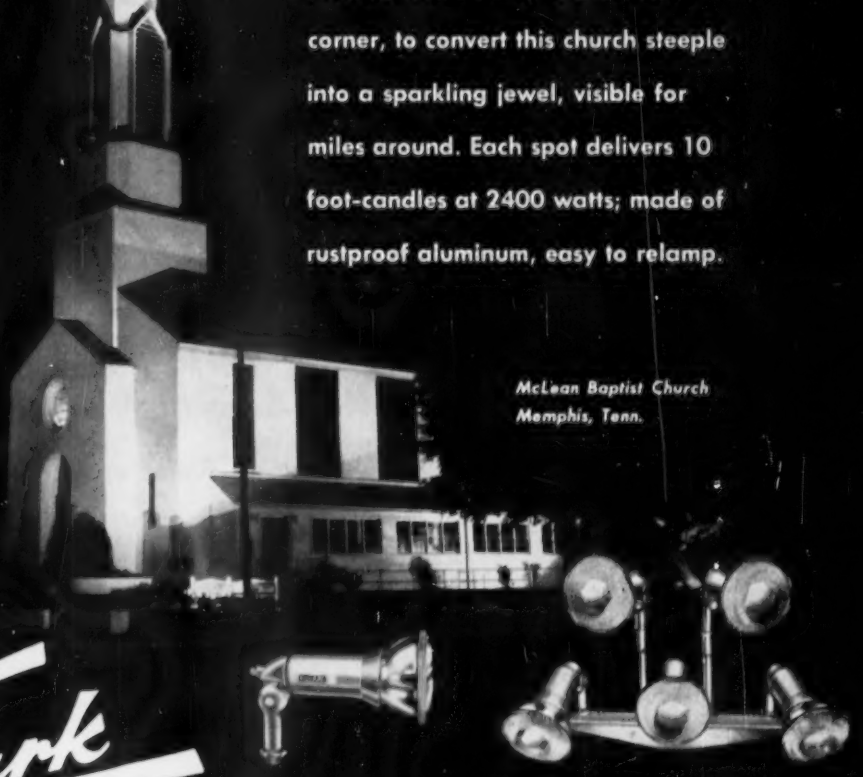
"Beauty Spots"

Illuminate 202 Foot Church Steeple

Eight Killark Spots (Model SSNB Fixtures) were used, two on each corner, to convert this church steeple into a sparkling jewel, visible for miles around. Each spot delivers 10 foot-candles at 2400 watts; made of rustproof aluminum, easy to relamp.



Model SSNB Sealed Beam Fixture
Par 56 Spot Lamps



McLean Baptist Church
Memphis, Tenn.

Killark

K
KILLARK
ST. LOUIS

ELECTRIC MANUFACTURING COMPANY

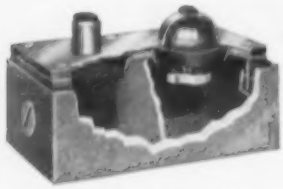
Vandeventer and Easton Aves. **St. Louis 13, Missouri**

SALES OFFICES and WAREHOUSE STOCKS	Atlanta	69 Mills St., N. W.	Dallas	1903 Griffin St.	Philadelphia	2014 Chancellor St.
	Boston	49-51 D St.	Denver	1073 Galapago	Pittsburgh	4830 McKnight Road
	Buffalo	278 Johnson St.	Detroit	8319 Mack Ave.	San Francisco	714 Harrison St.
	Chicago	1528 West Adams St.	Los Angeles	412 Seaton St.	Seattle	4130 First Ave., So.
	Cincinnati	1031 Meta Dr.				
SALES OFFICES	Baltimore	11 W. 25th St.	Kansas City, Mo.	616 W. 26th St.	New York	600 W. 181st St.
	Columbus	2700 E. Main St.	Minneapolis	826 Andrus Bldg.		

Sales Offices and Warehouse Stocks throughout Canada

Latrobe *Electrical* Products

"Latrobe" Floor Boxes and Wiring Specialities are designed for quick, easy performance. Stripped of frills and complex assembly, "Latrobe" Products do their job smoothly and economically.



Two Gang Adjustable Floor Box

Adjustable Boxes come in single-round or square bodies. Also in square type Single Gang, Two Gang, Three Gang and Four Gang Boxes. All adjustable boxes are now bonded which makes them fire-proof.

Non-Adjustable Floor Box

Represents the last word in unique design, neat appearance, fewest number of parts, and least amount of labor to install.

Insulator Supports

Malleable iron clamps of high tensile strength. Four sizes to fit all standard porcelain or glass insulators.

Sold Only Thru Wholesalers

Latrobe Products

Non-Adjustable Floor Boxes
Adjustable Floor Boxes
Gang Boxes . . . Cover Plates
Junction Boxes . . . Nozzles
Pipe or Conduit Hangers
Insulator Supports
Cable Supports . . . Fish Wire
Staple and Cable Clips

Write for new catalog

Sales Representatives in all principal cities.

Fullman Manufacturing Co.
1209-1215 JEFFERSON STREET
LATROBE, PA.

Busway (25)

A new 100-amp plug-in busway, designed for use where plug-in outlets over a wide area are necessary. Known as Type DH, it can be hung on 10-ft centers in the edgewise position. It is suited for industrial plants, commercial buildings, manual training shops, and laboratories. Type DH is used as a plug-in system and as a feeder for lighting systems and as a feeder or branch circuit from a switchboard or other power-consuming device. The busway is rated 100 amps, 600 volts maximum, 3- and 4-wire construction. It is listed by UL.

Distribution Assemblies Dept., General Electric Co., Plainville, Conn.

Recessed Fixture (26)

A new miniature adjustable recessed lighting fixture, called the "Mini-Sphere," is for multiple or single use in residences. Employing the new 30-watt R20 reflector lamp, the "Mini-Sphere" with its 360° swivel and 45° rotation provides a high-lighting source for the dining room table, drapes, fireplace and pictures.

Halo Lighting Products Co., 2104 North Orchard St., Chicago 14, Ill.

Armored Cable (27)

Interlocked armored cable with 600-, 5,000-, and 15,000-volt ratings, which may be used in place of cable-in-conduit, is now available with almost any number of conductors with oil-base, butyl-base, and other rubber or thermoplastic insulation. Designed for use in power feeder systems in electrical substations and industrial plants, the cables feature three conductors each with Rozone A insulation. The metallic armor, either galvanized steel, aluminum, or bronze, meets industry specifications.

Rome Cable Corp., Rome, N. Y.

Ballasts (28)

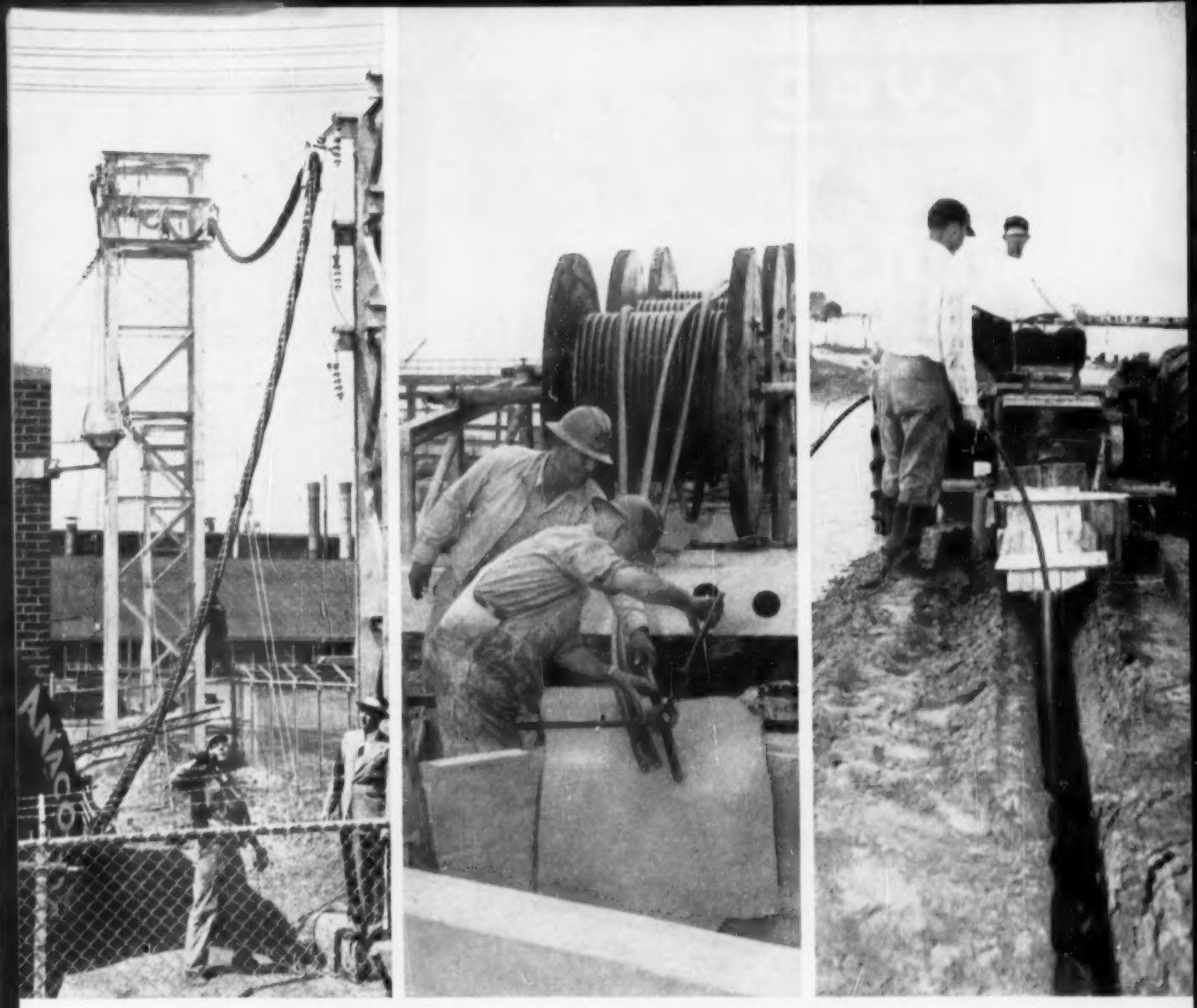
A new and complete line of indoor constant wattage ballasts for mercury lamp operation. They are suitable for either wall or pendant mounting, and have large double wiring compartments. ½- and ¾-in. knockabouts are located on top, bottom and sides of case. Some of the advantages are constant light output, maintained with plus or minus 2%; more ballasts per circuit.

Jefferson Electric Co., Bellwood, Ill.

Fan (29)

A new fan designed for installation between rooms. It provides maximum effectiveness for both heating and air conditioning systems. Model 814, mounted between studding, fits a 9¼-in. sq. wall opening. It is pull chain operated and adjustable for walls 2⅜ in. to 5¼ in. thick. It operates on 110-120-volt ac standard house current.

Nutone, Inc., Madison & Redbank Roads, Cincinnati 27, Ohio



Overhead . . . in ducts . . . underground

Order one cable for all three jobs . . . Anaconda Durasheath

Overhead . . . in ducts . . . underground. Use Durasheath* neoprene-jacketed cable for every type of power application up to 15 kv. Tough jacket resists weather, soil acids, abrasion, mechanical injury.

One continuous run without splices. Run Durasheath from underground, to overhead, to ducts, *in one length* without splicing. Light, flexible, it handles easily. Costs less to install.

Stock one cable instead of three. You save space, paperwork with all-purpose Durasheath. One cable does the work of three. You cut inventory. Versatile Durasheath excels everywhere.

See the Man from Anaconda or your Anaconda distributor for full information. Anaconda Wire & Cable Company, 25 Broadway, New York 4, New York.

*Trade Mark

LIVE BETTER ELECTRICALLY

ASK THE MAN FROM **ANACONDA®**

FOR **DURASHEATH CABLE**

QUAD

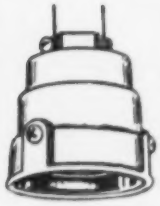
Offers the Latest Development in a

QUICK

Connecting and Disconnecting

SOCKET

FOR INDUSTRIAL REFLECTORS



IT'S THE

QUAD

EASY TACH

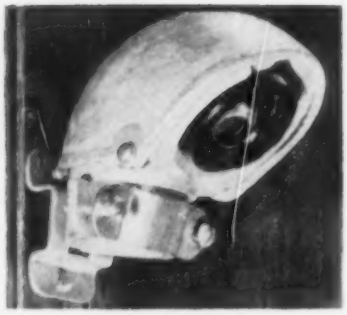
NOW the complete line of QUAD REFLECTORS can be equipped with EASY TACH, a socket with simplicity of design that makes quick connecting and disconnecting of lamped reflectors very easy.

Any size or style of QUAD socket type reflector with hex hole may be converted to the quick connecting and disconnecting type by substituting the new EASY TACH socket for the regular one-piece ½-inch medium or mogul socket. This new socket feature has proved to be a great advantage in making reflector sales move at a faster pace.

Write for complete descriptive literature.

QUADRANGLE MFG. CO.

32 S. PEORIA ST. CHICAGO 7, ILL.



Service Entrance Caps (30)

A new line of service entrance caps that take rigid conduit, EMT, as well as service entrance cable. The first size in the line will accommodate three No. 1/0 service entrance cable and one ½-in. rigid or thin-wall conduit. An adaptable saddle feature of cap permits use of either rigid conduit, thin-wall conduit or service entrance cable. Cap is extended to form a visor or shield to protect raceway against entrance of rain and snow. It is made of cast iron and hot dip galvanized. It will be available in sizes ranging from ½ to 2 in.

Thomas & Betts Company, Elizabeth, N. J.

Intercom Equipment (31)

An automatic dial switchboard has been added to the Dictograph line of intercommunication equipment which allows the user to key his important contacts and dial the others. Some of the features are privacy, paging facilities, automatic ring signal, identification of incoming calls, executive right-of-way, and automatic "memo of call." The integration of the two communication systems become Dictomatic and offers a customized executive intercommunication system with special emphasis on management requirements. Automatic switchboard is available from 30 lines to unlimited size to serve the largest intercommunication requirements. An external power supply of 110 volts ac is required.

Switchboard is protected with a dust-proof cover of aluminum, 31 in. high, 23 in. wide and 14 in. deep. Power supply is housed in a separate cabinet of smaller size and can be located near the switchboard.

Dictograph Products Inc., 95-25 149th St., Jamaica 35, N. Y.

Recessed Reflector Lamp (32)

A new series of recessed reflector lamp down-lights provides a separable, spring-mounted, contoured frame plus a series of improved installation features. The prewired units, which are supplied completely assembled, permit direct wiring with standard building wire. The square plaster frame provides easy "framing-in" or may be used with standard Halo bar hangers. The series is available for the 75-watt R30 and 150-watt R40 reflector lamps.

Halo Lighting Products Co., 2104 North Orchard St., Chicago 14, Ill.

Timer (33)

A new built-in timer for controlling electrical circuits in the home. Called Lamp-Lyter; it is particularly well suited for automatically controlling post lanterns, porch lights, or wall outlets. Electrical outlets on the circuit automatically turn "on" and "off" at any pre-set hour of the day or night. Timer mechanism is mounted in a junction box. Leads are provided to wire the unit directly into the electrical circuit. Once set, the timer repeats its automatic operation every 24 hours, closing the circuit for as short a period as 15 minutes or as long as 23 hours. Length of timing cycle may be changed whenever desired by sliding time pointers to another hour of the day or night. Each timer also has a slide switch manual control lever to turn controlled unit on or off as desired without interrupting the automatic setting. Bulletin NR No. 187 is available.

International Register Co., 2624 W. Washington Blvd., Chicago 12, Ill.

NOW...

Set a ¼" stud in steel or concrete with one light tap!

ONLY $39.95

NEW Remington "Mighty-Mite" STUD DRIVER

HERE'S the new handy-sized cartridge-powered Remington stud driver that handles all fastening jobs requiring a ¼" stud. "Mighty-Mite" sets a stud a minute—with no pre-drilling or outside power required, and it's yours for only $39.95.

"Mighty-Mite" is compact and easy to operate. Simply unscrew the upper assembly, insert the 22 caliber cartridge with the desired ¼" stud, and you're ready to anchor wood sections or steel fixtures to concrete or steel! One light tap of a hammer or mallet on the firing pin and your stud is set firmly in place, straight as an arrow.

We have all the facts about the new Remington "Mighty-Mite" in an illustrated free booklet. Included are many applications, with pictures, of this versatile stud driver that pays for itself in just a few fastenings. Send for your copy today by mailing the coupon below.

Model 455A Remington Stud Driver—medium and heavy-duty companion tool to the low-cost "Mighty-Mite."

Remington

DUPONT

Industrial Sales Division, Dept. 612
Remington Arms Company, Inc.
Bridgeport 2, Conn.

Please send me your free booklet which shows how I can speed the job and save with the new Remington "Mighty-Mite" Stud Driver.

*Name*_____ *Position*_____

*Firm*_____

*Address*_____

*City*_____ *State*_____

THERE IS A DIFFERENCE IN

G-E White rigid conduit is manufactured for easier

When you look through a length of G-E WHITE you'll see that its interior surface is uniformly smooth all around, from end to end. This smoothness is one of the qualities that makes G-E White rigid conduit different — a conduit quality that gives you easier fishing and wire pulling . . . helps you make speedier installations.

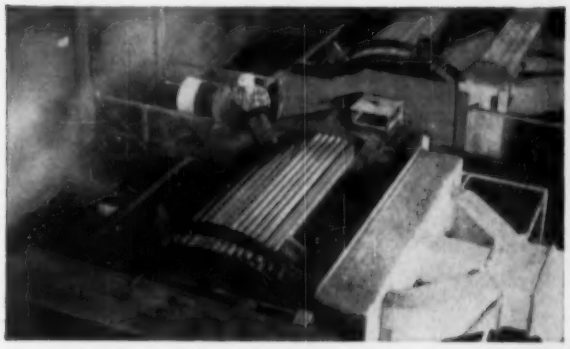
At General Electric, special manufacturing and quality control procedures are responsible for the smooth interior. "Pickling" in acid removes scale and impurities from the untreated conduit. The interior coating is applied evenly throughout the entire length, forming a continuous barrier against corrosion. This coating is specially formulated to provide a low-friction, corrosion-resistant interior that cuts down wire-pulling effort.

EASY BENDING IS ANOTHER DIFFERENCE

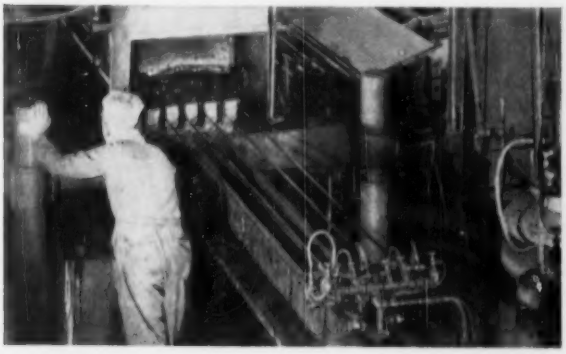
G-E WHITE bends without kinking or flattening, and threads easily, too. That's because General Electric bonds the exterior zinc coating to the rigid conduit by *metallizing*, a process that eliminates the excessive heat, and the subsequent quenching and straightening which tend to work-harden ordinary conduit.

Your General Electric distributor stocks

EVERY LENGTH OF G-E WHITE is carefully checked for interior cleanliness and uniform smoothness. This strict quality control gives you easy fishing and wire-pulling through every length.



"PICKLING" IN SULFURIC ACID removes all the brittle scale and any impurities from the reamed and threaded conduit. The result is a chemically clean interior and exterior.



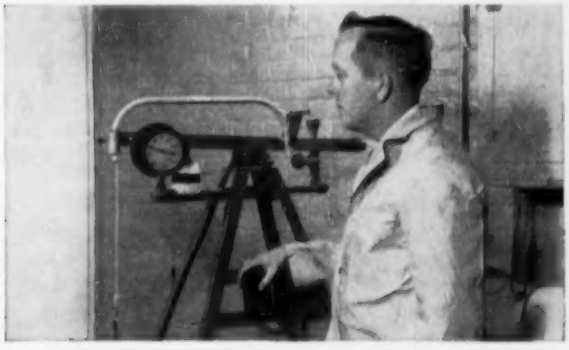
SPRAYING THE CONDUIT INTERIOR with a specially formulated Glyptal* coating provides a pliable finish that won't chip or crack even during bending. This low friction coating helps make wire-pulling an easier job.

CONDUIT

fishing and wire-pulling

an ample supply of G-E WHITE to meet your requirements. Ask him for detailed information or write for literature to Section C72-1218, Construction Materials Division, General Electric Company, Bridgeport 2, Connecticut.

**Registered Trade-mark General Electric Company*

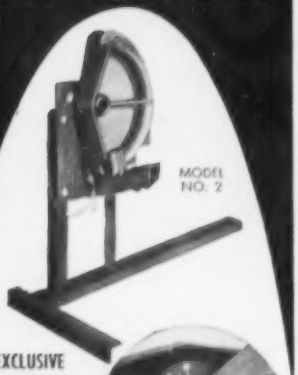


LABORATORY PULL TESTER proves that G-E WHITE offers 14% easier wire-pulling than ordinary conduit. Here, an inspector tests a ½"-diameter, 3-ft length with two 90-degree bends, for continuous pull.

Progress Is Our Most Important Product

GENERAL ELECTRIC

Make any type of conduit bend faster & easier



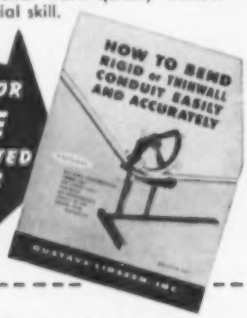
EXCLUSIVE CALIBRATED DEGREE SCALE ASSURES YOU OF ACCURATE BENDS EVERY TIME

NO CHANGING PARTS
These are complete machines of all steel construction. No loose parts to be misplaced or lost. Machines are always in readiness to bend conduit easily and accurately.

RUGGED...LOW MAINTENANCE
Designed for real outdoor work. Machines incorporate a simple but powerful toggle-ratchet mechanism that requires no maintenance other than an occasional drop of oil. Rugged stand with built-in square and scale gives solid support at a comfortable working height.

FASTER, SIMPLE TO USE
You get perfect, smooth uniform bends every time. Repeat bends and 180° bends are simple, easy to make. You turn out professional work quickly without special skill.

WRITE FOR FREE ILLUSTRATED FOLDER



SEND TO:
LIDSEEN OF NORTH CAROLINA INC.
1050 FIRST STREET, HAYESVILLE, N. C.

NAME_____

COMPANY_____

ADDRESS_____

CITY_____

Transformers (34)

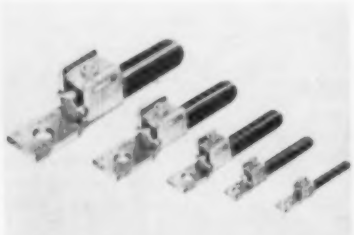
A new line of molded indoor or outdoor current transformers using epoxy resins for switchboard or cabinet mounting. The units, designated CGM, are designed for use in limited space, with ammeters and wattmeters on industrial applications. Available in ratings from 100 through 800 primary; 5-amp secondary; 25/400 cycles. Impulse level is 10 kv. Insulation class is 600 volts. Cable carrying load current is passed through opening in transformer and constitutes primary winding. Transformer is inserted on load cable. Leads are carried from terminals of winding to ammeter to be operated. Bulletin is available.

Standard Transformer Co., Warren, Ohio

Heating (35)

A complete baseboard electric heating system available in 4-, 6- and 8-ft sections rated at 1000, 1500 and 2000 watts (240, 208 or 120 volts). The "Calrod" type heating elements are ¼-in. in diameter and have 20 sq ft of aluminum fins per 1000-watt 4-ft section. They are UL approved. Literature is available.

Spartan Electric Radiator Corp., 52-55 74th St., Maspeth 78, N. Y.



Lugs (36)

Socket type set screws feature the new "wide range" pressure lugs for electrical installations. They are especially designed for use in entrance switches, service troughs, panelboards, shallow housings. Available in five models adaptable to a cable range of 14 awg to 500 mcm. They are completely cadmium plated for protection against corrosion. Positive conductivity is provided by the copper formation of the wire trough and large contact area of the body of the lug unit. Listed by UL.

National Electric Products Corp., Gateway Center, Pittsburgh, Pa.

Limit Switch (37)

A new type of precision limit switch that can be replaced on the job in a few seconds is called the "Plug-In Limit". Unit consists of two parts; a terminal block enclosure, containing wiring connections, and a switch enclosure, including all moving mechanical and electrical parts. The switch enclosure is fitted with four current-carrying spring plugs, integrally molded to basic switching element, and terminal block with four corresponding receptacles. When plugged together, they form a complete switching unit. Designated 201LS1, it meets the requirements on NEMA Industrial Control Standards for non-ventilated enclosures of type IV-1C1-1.12 watertight and type V1-1C1-1.15 submersible.

Micro Switch, Div. of Minneapolis-Honeywell Regulator Co., Freeport, Ill.

Lamps (38)

Designed for indoor or outdoor use, the new line of Colortone (TM) weather-resistant spot and flood lamps includes four colors: blue, red, green and yellow. Rated at 150 watts and 115-125 volts, the PAR-38 lamps incorporate nonfading lenses whose color is built into weather-resistant glass. Lamps are protected against breakage by snow, rain, etc., by a transparent silicone coating over lens surface.

Westinghouse Electric Corp., Box 2278, Pittsburgh, Pa.

Announcing Another New Product for
The Electrical Industry from Reynolds

SILVER PLATED aluminum BUS BAR

Reynolds new Silver Plated Bus Bar offers substantial economies over unplated copper bar . . . from 35 to 50 % lower in price. It should be of prime interest to manufacturers of metal enclosed switchgear, power transformers, bus duct, panel boards and other electrical equipment, and to electrical contractors for the following reasons:

It is attractive in appearance, light in weight and represents a sizeable savings over commonly used bare or plated copper conductors.

Bolted joints can be made with no prior preparation of surface and no joint compound.

Silver plating provides a surface readily tinned, soldered or brazed.

Silver plating permits a higher operating temperature in many installations according to electrical codes.

It provides minimum contact resistance for sliding or pressure contacts.

Turn page for more information.

The Finest Products Made with Aluminum are made with REYNOLDS ALUMINUM

TECHNICAL DATA ON REYNOLDS SILVER PLATED ALUMINUM BUS BAR

A Development of Reynolds Research Laboratories

One of the most persistent problems in the application of aluminum busses has been in the making of reliable electrical connections with simple and inexpensive techniques. This problem is always related in one way or another to the oxide film on the surface of the aluminum, and the possibility of galvanic corrosion between aluminum and copper to which it might be connected. Silver contact surfaces are generally recognized as the most effective means for insuring superior contact reliability.

Silver plated aluminum bars have not heretofore been commercially available and no industry standards have been established for the quality of silver plating. Since industry practices varied so widely, the Reynolds Research Laboratories established the following requirements for silver plated aluminum bus conductors:

- ★ **Perfect adhesion between the plating and the base metal . . . prevents blistering or peeling off under service conditions.**
- ★ **Free of porosity . . . ordinary platings on aluminum tend to be porous, could lead to galvanic corrosion of the aluminum under certain conditions.**
- ★ **Good resistance to abrasion . . . plating must remain intact even though "wiping" contacts may be repeatedly made.**
- ★ **Maximum formability . . . forming operations can be performed without danger of peeling.**
- ★ **Plating costs must be low . . . offer substantial savings over *bare* copper bus.**
- ★ **Plating process must be applicable to all aluminum alloys commonly used for aluminum bus bars.**

REYNOLDS SILVER PLATED ALUMINUM BUS CONDUCTORS MEET ALL OF THE ABOVE REQUIREMENTS!

In addition, a performance specification incorporating appropriate production quality control testing procedures has been developed to insure that the finished products will have uniformly high quality platings.

COMPARISON OF RECTANGULAR SILVER PLATED ALUMINUM BUS BARS WITH UNPLATED COPPER BARS

60 Cycle AC Ampacity (1) (Current Carrying Capacity)	Aluminum Alloy 6101-T62 30°C Rise	Copper 30°C Rise	Cost per Foot Silver Plated Aluminum 6101-T62	Cost per Foot Unplated Copper (2)
385	¾" x 1"		$ .30	
395		¼" x 1"		$ .54
420	¼" x 1½"		$ .31	
925	½" x 3"		$ .85	
960	¼" x 4"		$ .81	
970		¼" x 3"		$1.59
1350	¼" x 6"		$1.21	
1405	⅜" x 5"		$1.40	
1485		¼" x 5"		$2.20

(1) Ampacity ratings based on standard indoor conditions.

(2) Based on October 8, 1957, copper prices.

For details and assistance from Reynolds Engineering Service on your products or problems, call your local Reynolds office or write *Reynolds Metals Company, P.O. Box 1800-EW, Louisville 1, Ky.*

IMPROVING ELECTRICAL SYSTEMS FROM POWER SOURCE TO END USE

The Finest Products Made with Aluminum are made with REYNOLDS ALUMINUM

Watch Reynolds All-Family Television Program "DISNEYLAND", ABC-TV.

Adjustable Speed Drives (39)

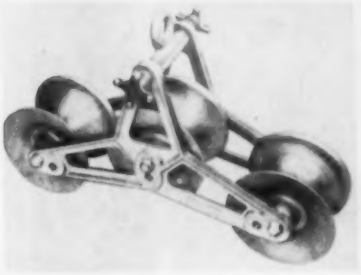
A new line of packaged adjustable speed drives designed for minimum maintenance. The new speed variators are available in ratings of 3 through 150 hp and in speed ranges of 8 to 1 and higher. They are designed for use on continuous processing lines, or wherever adjustable speed for fine control is needed. A new Amplistat regulator with silicon rectifiers is standard on line. Regulator provides smooth, timed acceleration and deceleration to preset speeds in addition to voltage regulation. Motor-generator set is of two-unit, four-bearing design. Tri-Clad 55 ac motor and dc generator are connected by flexible coupling. Standardized power unit control devices are unit-mounted and front-connected. Units can be installed end-to-end, end-to-wall or within 6 in. of back wall.

General Electric Co., Schenectady 5, N. Y.

Lighting Fixtures (40)

A complete line of store lighting fixtures, featuring incandescent and fluorescent designs. In addition, a complete assortment of ceiling hangers, wall bracket mounts and counter mounts are available. All incandescent cone, cylinder and sphere directors are furnished as individual units or mounted as spans with any specified number of units. Fluorescent cornice, strip showcase models are available in required lengths for all sizes and types lamps, and in any combination. Provisions are made on all models for joining in continuous runs. All fixtures are UL approved and ETL certified.

Peerless Electric Co., 576 Folsom, San Francisco, Calif.



Cable Guide (41)

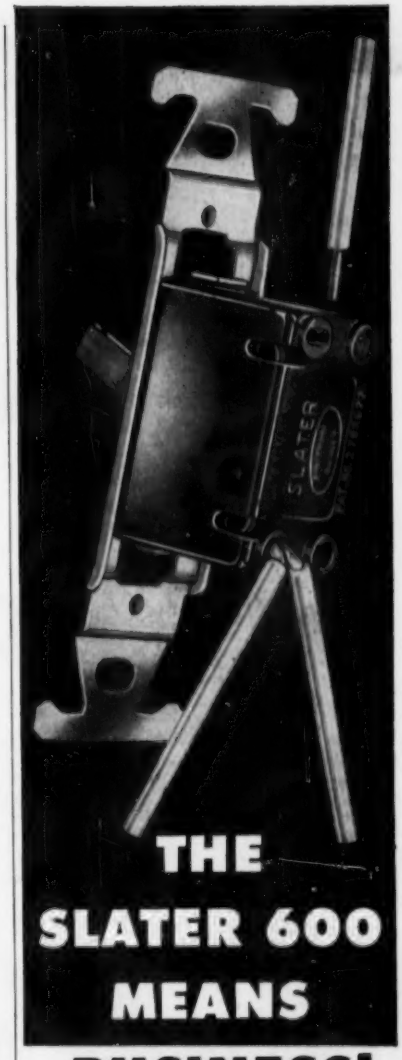
A new triple pulley cable guide to simplify the installation of cables in a cable trough or ladder system. Three aluminum sheaves are mounted in an aluminum frame that can be secured to a structural support, and so simplify the pulling of cables around horizontal or vertical bends. The pulleys are adjustable to different radii, thus permitting a single device to be suitable for any turn desired. Cables can be laid in over the frame.

T. J. Cope Division of Rome Cable Corp., Collegeville, Pa.

Exit Sign (42)

The 45R Series fluorescent exit sign is designed for recessed ceiling installation. Inscription panels are ⅛-in. thick, clear Plexiglass, available with either one or two faces. Selection of lettering in 3-, 4-, 6- and 8-in. letter-height and in color combinations to meet most code requirements. Removable wiring compartments with choice of fluorescent, incandescent or lumiline lamp, which can be wired on one circuit or individually on separate circuits. Literature available.

McPhilben Mfg. Co., Inc., 1329 Willoughby Ave., Brooklyn 37, N. Y.



THE SLATER 600 MEANS BUSINESS!

The newest, greatest wall switch for fast, easy installation... quiet as a mouse!

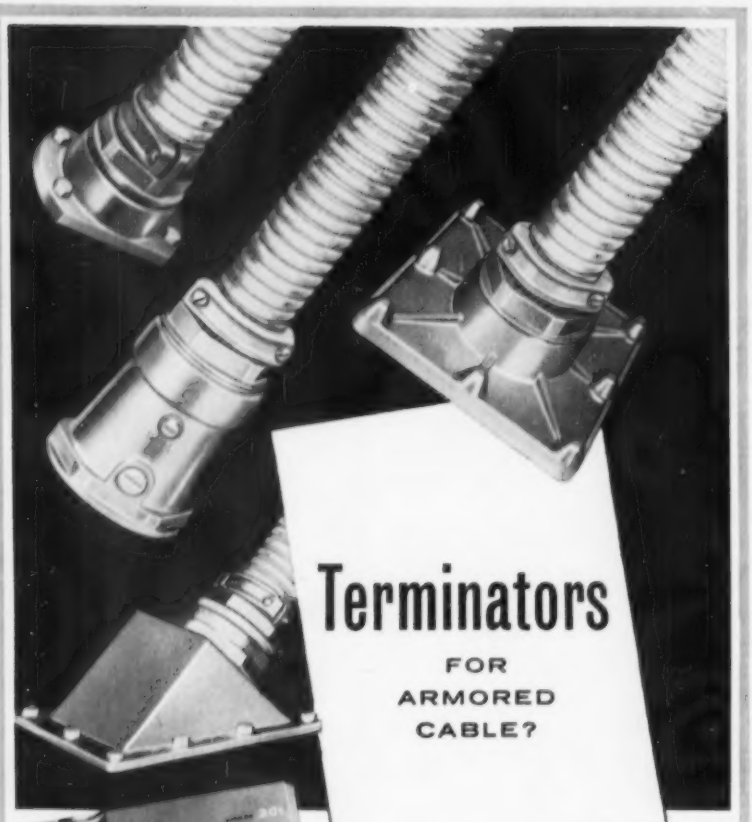
No screws, no posts, no special tools or "knack" needed.

One or two #12 or #14 wires slip into bulldog grip clamps through specially designed holes in switch case. Cuts installation time more than 50%!

Patented, instantaneous side release.

WRITE FOR THE SLATER CATALOG. IT LISTS HUNDREDS OF TIME AND TROUBLE-SAVING WIRING DEVICES TO MAKE YOUR JOB EASIER ... MORE PROFITABLE.

Slater
Lifetime Wiring Devices
SEA CLIFF AVENUE • GLEN COVE, NEW YORK
ORIOLE 6-1100



this PLM catalog can help you simplify the job!

Here's fast help in figuring terminating needs for armored cable installations. PLM Terminators include types for through mounting, bracket mounting or flange mounting, as well as compound-filled types, for cable to 3½" in diameter and larger—either open interlocked or new, sealed types.

Catalog also includes complete listing of terminating and splicing kits for armored, neoprene-jacketed and lead-covered cable through 23 kv. Write for copy — see how PLM can help simplify planning and installation. PLM Products, Inc., 3875 W. 150th St., Cleveland 11, Ohio.

PLM Terminators
Splicing Kits
Conduit Ventilators

Magnetic Insert Finder **(43)**

New magnetic insert finder has been designed to locate concrete-buried steel duct inserts in existing underfloor distribution system when additional floor outlets are to be installed. The finder is made of brass with a black-crackle finish. Proximity of duct and insert is detected by a strong permanent Alnico magnet housed in the center of the finder, and direction is indicated by two bisecting red and white hands which pivot inside the glass-covered circular base. Four small recessed lights at top of finder allow operator to determine precise center of insert. These lights, which are turned on by a miniature pushbutton switch at top of hand-grip, automatically go out as finder approaches center of insert. Dead center is indicated when all lights are out.

Conduit Products Department, General Electric Co., Bridgeport 2, Conn.

Hoist **(44)**

A new hoist for overhead lifts, called Hi-Hoist, was originally designed to make a one man job out of two-man fluorescent lighting fixture installations but it has a wide range of applications. Basically, the Hi-Hoist eliminates one man from the jobs that take one man to "hold" and one man "to do."

It will lift loads of 100 lbs to a height of 13 ft. The telescoping lift mechanism is controlled by non-slip, cable drum, crank operation. Entire unit rolls on 3-in. casters.

Lantz Manufacturing Company, Inc., Valparaiso, Ind.

Mercury Luminaire (45)

A new mercury luminaire called No. 5442 "Ultra-Lite" is now available for improved high-level, uniform lighting of parking lots, shopping center plazas, playgrounds, parks, and other sites where horizontal, large-area illumination is needed. Each luminaire houses four parabolic reflectors and prismatic glassware assemblies under one semi-spherical aluminum dome. The four assemblies are placed to produce a square pattern of uniform light over the widest possible area. Ultra-Lites are available in two designs; the 72-in. with spun aluminum dome and reflectors tilted at 15° and the 52-in.

Revere Electric Mfg. Co., 6009 Broadway, Chicago 40, Ill.

Switch and Fuse Equipment (46)

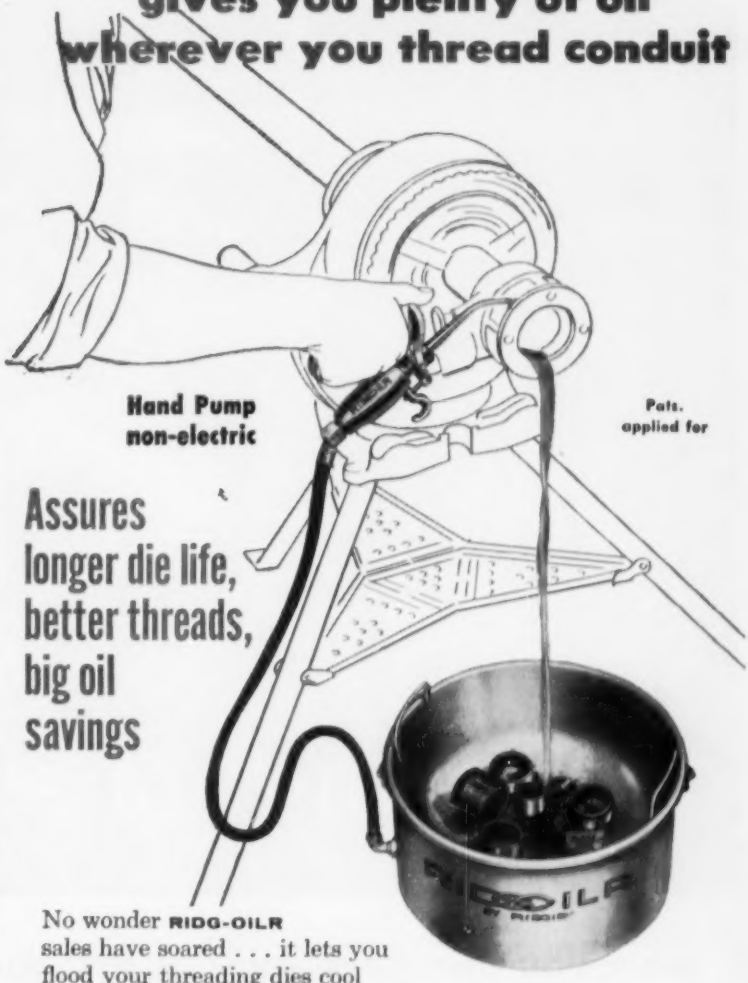
New rollout switch and fuse equipment has been announced. The new load-break equipment, consisting of an interrupter switch and current limiting fuses, is capable of interrupting full load current on circuits where unit is applied. Continuous current rating of switch is 600 amps from 2.4 to 13.8 kv. Switch and fuse combination offers provisions for both normal switching and fault protection on circuits with available short circuit currents up to 60,000 rms asymmetrical amperes. Equipment gives accessibility for inspection and maintenance. All-new, dead front, switch and fuse equipment, designed for outdoor or indoor application, can be furnished for single or multiple installation. Equipment is applicable to both commercial and industrial systems.

Medium Voltage Switchgear Department, General Electric Co., Philadelphia, Pa.

Handy New Portable

RIDGID OILR

gives you plenty of oil wherever you thread conduit

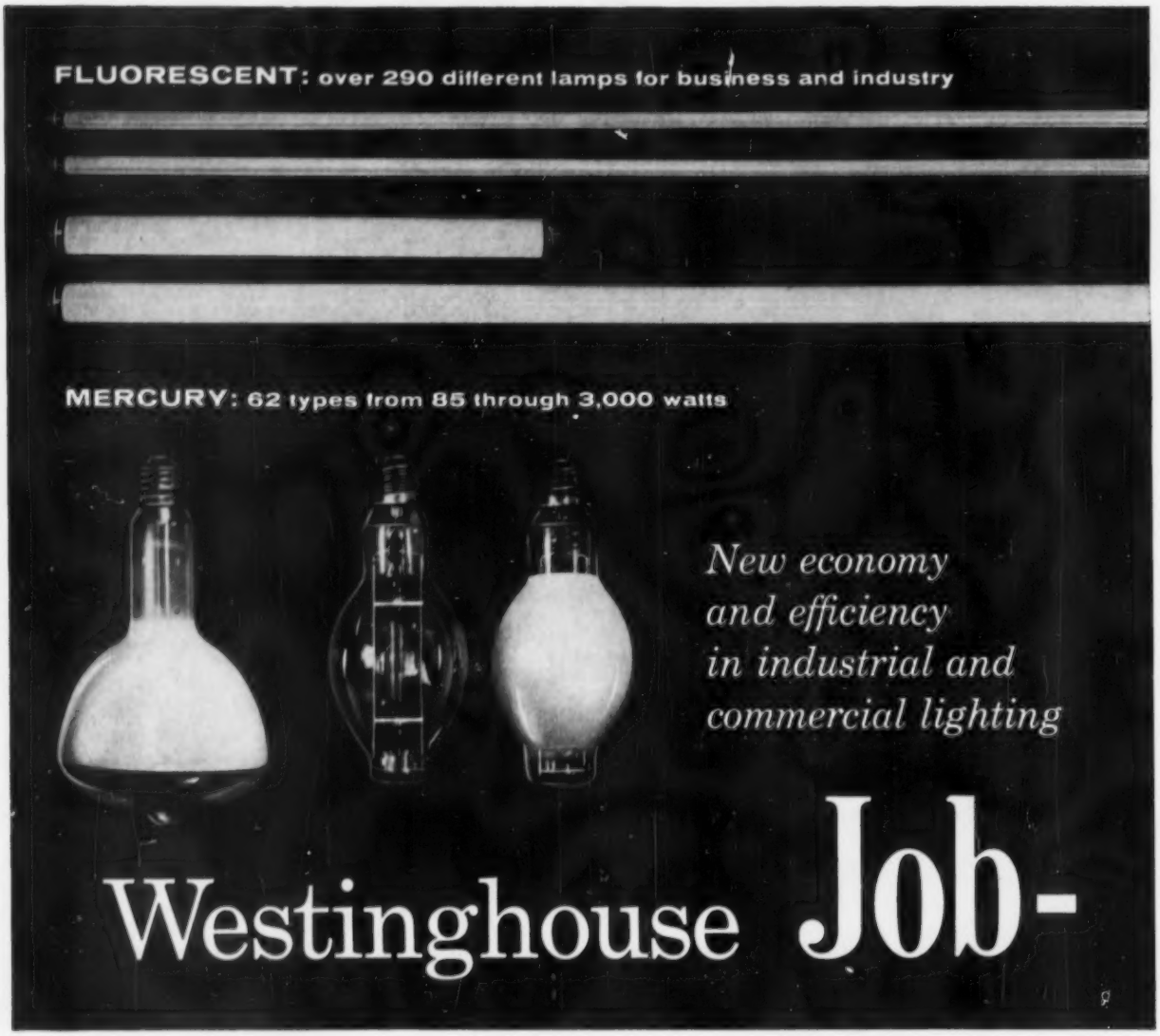


No wonder **RIDG-OILR** sales have soared . . . it lets you flood your threading dies cool wherever your work is, makes them cut better threads, last longer. Consists of screened chip-pan in circulating oil reservoir with hose-connected hand pump-gun, easy to operate—light to carry. Oil is double strained, used over and over. No messy floors. Quickly pays for itself—buy it at your Supply House!

The Ridge Tool Company • Elyria, Ohio, U.S.A.

RIDGID

Work-Saver Pipe Tools


FLUORESCENT: over 290 different lamps for business and industry
MERCURY: 62 types from 85 through 3,000 watts
New economy
and efficiency
in industrial and
commercial lighting
Westinghouse Job-

Now you can have exactly the right *kind* of lamp in exactly the right *size* for every individual lighting job

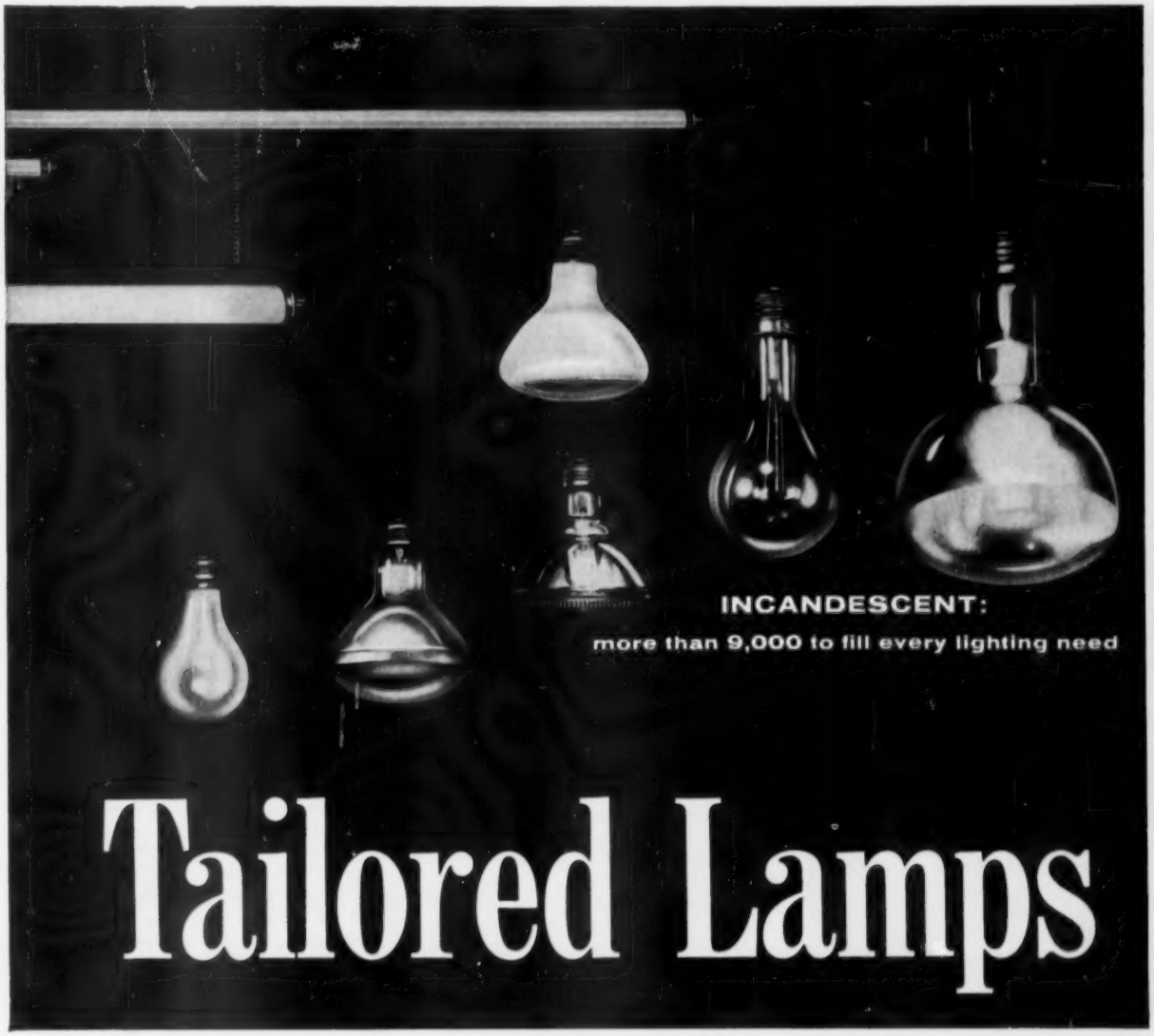
Westinghouse again demonstrates its leadership in lighting with lamps *Job-Tailored* to cut costs, reduce accidents, improve both "See-Ability" and morale. All this is possible because Westinghouse produces more than *10,000 kinds of lamps* with exclusive developments like those below which give you more for your lighting investment.

Fluorescent Lamps, for example, have a new high-intensity phosphor—*Ultralume*™—which gives more lumens per watt plus uniform end-to-end light for the life of the lamp.

Mercury Lamps with special "hard" glass *Weather Duty*™ construction. Can't be harmed by snow, rain, condensation—even without protective coverings.

Incandescent Lamps provide an extra measure of quality with exclusive *Lifeline Filament*™—made possible because only Westinghouse controls the manufacture of filaments from tungsten ore to finished wire.

In addition, Job-Tailored lamps give you more light from existing fixtures. By standardizing on bases, bulb sizes and light center lengths, Westinghouse provides a high degree of *lamp interchangeability*. As a result, with many Westinghouse lamps, you may increase light output to more efficient working and safety levels without changing fixtures.



Tailored Lamps

FREE WESTINGHOUSE JOB-TAILORED LIGHTING SURVEY SHOWS YOU HOW TO GET THE MOST FOR YOUR LIGHTING DOLLAR. To enable you to spot places in your present lighting installations where incorrect lamps may be costing you money, call in a Westinghouse Lamp Representative. With your plant engineer or maintenance supervisor, he will inspect your lighting installation, make a careful analysis of his findings, and report his recommendations. To get this free service, simply fill out the coupon. You'll be dollars ahead with Westinghouse JOB-TAILORED lighting.

YOU CAN BE SURE...IF IT'S

Westinghouse

WESTINGHOUSE ELECTRIC CORPORATION
LAMP DIVISION
Industrial-Commercial Lighting Service
Bloomfield, New Jersey

Please have your Lamp Representative in my area make an appointment with our Mr. _____ to arrange a survey of our lighting needs.

NAME _____

COMPANY _____

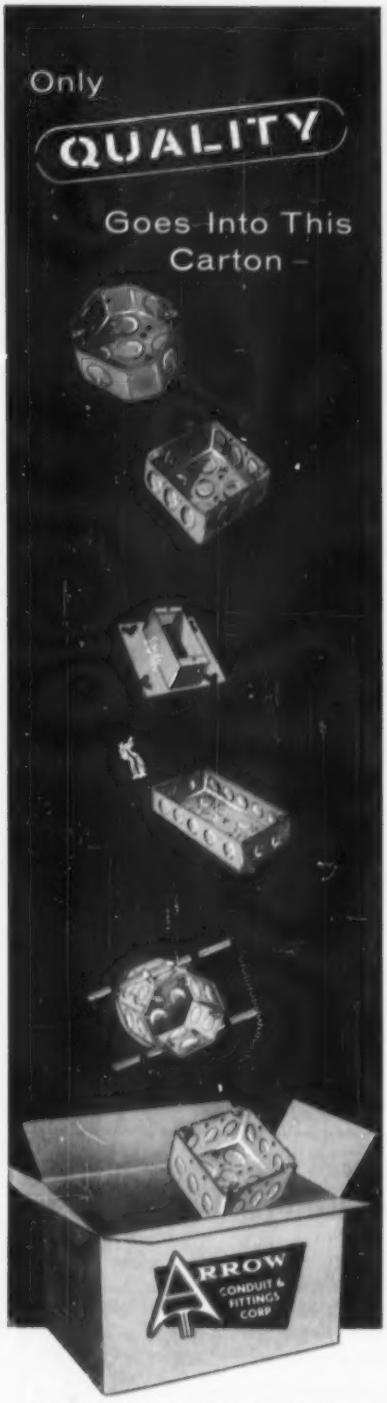
ADDRESS _____

CITY _____ **ZONE** ____ **STATE** _____

FULL NAME OF PLANT ENGINEER _____

PHONE NUMBER _____

I am interested in ☐ incandescent
☐ fluorescent ☐ mercury lighting.

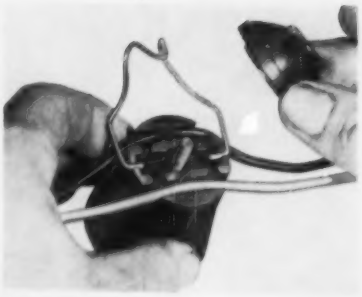


OUTLET BOXES • GANG BOXES •
COVERS • BOX SUPPORTS

ARROW CONDUIT
& FITTINGS CORP.

129 30th Street, Brooklyn 32, N. Y.

Sales Representatives & Warehouse Stocks*
BALTIMORE, MD. • CHARLOTTE, N.C. • *CHICAGO, ILL. • *CINCINNATI, OHIO • *DENVER, COLO. • DALLAS, TEX. • *LOS ANGELES, CALIF. • *MIAMI, FLA. • NEW YORK, N. Y. • NEWTON CENTRE, MASS. • *PHILADELPHIA, PA. • ROCHESTER, N. Y.



Sockets (47)

Designed for temporary decorative or emergency lighting, the new 5464 pin type sockets can be used anywhere in any weather. They are applied directly to the wire. A white wire indicator is molded on the body. An exclusive patented 4-spline construction automatically centers No. 12 or No. 14 rubber coated wire. It is rated at 660 watts, 250 volts and meets all requirements of UL. Literature is available.

Pass & Seymour, Inc., Solvay Station, Syracuse 9, N. Y.

Hand Lamp (48)

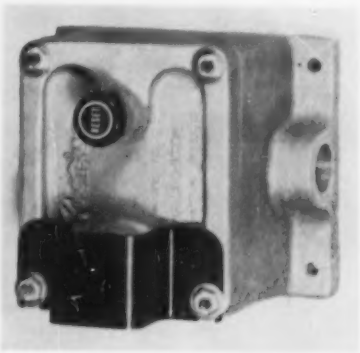
A new explosion-proof, hand lamp, designated Type HEA, is designed for Class I, Group D, with 100-watt, A-21 lamp. All exposed metal parts are made of non-sparking aluminum. The insulated handle is made of high impact-resistant plastic. Globe is heat and impact-resistant. For relamping, the metal assembly is removed as a unit. Portable cord is installed or replaced by means of a 3-pole connector provided within the handle. One pole of connector is used for the ground conductor of the 3-wire portable cord. Bulletin is available.

Pyle-National Co., 1334 N. Kostner Ave., Chicago 51, Ill.

Switch (49)

A new electro-mechanical control for automatic switching of street lighting circuits, designated the Synchro switch. Tubes and transistors are replaced in switch by a cadmium selenide photocell which senses any change in surrounding lighting conditions. Unit also incorporates a synchronous motor and a high-capacity, snap action switch which turns the street light on or off, depending on light conditions. System is protected against transient light, such as lightning and automobile lights, by an integral time delay. Control has a range of adjustment from .5 to 8 footcandles. Both turn-on and turn-off points can be adjusted. Load rating of control is 1200 watts at 120 or 240 volts.

Tuttle & Bailey, division of Allied Thermal Corp., New Britain, Conn.



Vibration Monitoring System (50)

Vibration monitoring systems are now available for rotating and reciprocating equipment in hazardous locations. The explosion-proof system is designed for use in Class I, Group D and Class II, Groups F and G hazardous locations. Both the malfunction and detector and control units are mounted in explosion-proof casings. The control unit is used to provide a time delay when protected equipment is started, thereby presenting an alarm or shutdown from single shocks or transient disturbances. Available for ac or dc circuits. Manual, electrical, or automatic resetting of the system also are available.

Instrument Division of Robertshaw-Fulton Controls Co., 2920 North 4th St., Philadelphia 33, Pa.

Lighting Control (51)

A tubeless street and highway lighting control Lumatrol named Model R. Light is sensed by a hermetically sealed, replaceable cell and switching is accomplished with a long life, plug-in hermetically sealed electrostatic relay. Expulsion type lightning arrester available on this model. Model R is housed in a specially processed, weatherproof cover with omni-directional light sensing characteristics. This, together with plug-in mounting, makes it simple to mount on either luminaires, poles or cross-arms. Bulletin 101 is available.

Micro Balancing, Inc., Garden City Park, N. Y.

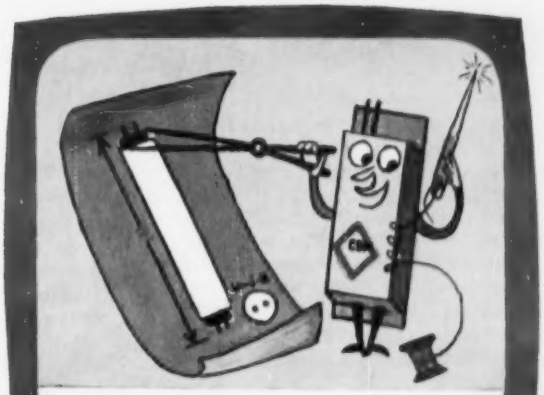
INSTALLATION COSTS LESS...

with fixtures using

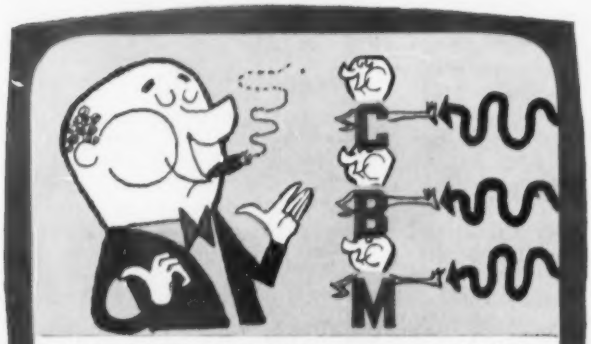
Certified CBM Ballasts

KEEPS LABOR COSTS DOWN, TOO. (Low power factor can boost these costs as much as 65%.) CBM Ballasts mean fewer circuits, fewer man-hours needed.

SAVE ON WIRE COSTS—for High Power Factor in Certified CBM Ballasts saves your customers from expensive oversize wiring needed by low power factor equipment. Guards against penalty charges on light bills, too!



TAILORED TO THE TUBE . . . Certified CBM Ballasts provide rated light output from tubes, which means lower illumination costs . . . higher lighting levels with fewer fixture units.



PROTECTION FOR YOUR CUSTOMERS because CBM Ballasts are made to exacting performance specifications; then checked and certified by ETL. And they're also listed by UL.

WRITE FOR CBM BOOKLET
"Why High Power Factor ballasts cut your lighting costs"

Seven leading manufacturers now make up

CERTIFIED BALLAST MANUFACTURERS

2116 KEITH BUILDING • CLEVELAND 15, OHIO

Participation in CBM is open to any manufacturer who wishes to qualify

CBM-4-CU

Enclosures (52)

A series of explosion-proof, dust-tight and weather-resistant magnetic across the line motor starter Pylets. Designated EMS series motor starter Pylets, and ECM series combination motor starter Pylets, these enclosures of the air brake type are available for 1½ to 100 hp. Close vertical and horizontal mounting centers may be used without interference with adjacent units because of compact, rectangular shape of enclosure and because access to starter and wiring is through a single front cover opening.

Pyle-National Co., 1334 N. Kostner Ave., Chicago 51, Ill.

Terminal Block (53)

New "medium duty" sectional terminal block speeds block assembly for any number of circuits. Tubular contacts for stripped wires or combinations of two or more wires are available with screw contact for No. 18 through No. 8, or clamp contact for No. 22 through No. 10 wire. Strap screw contacts for terminal-ended or looped wires accommodate any ⅞-in. or narrower ring or spade terminal for No. 6 or larger stud. All contacts feature electrolytic copper, heavy plating, positive wire stops and attachment to moldings. Contacts are ⅞-in. centers. These blocks can be anchored at any desired location and can be extended in length. Rated at 750 volts, the blocks will withstand voltages in excess of AIEE requirements. Block sections are 63/64-in. high by 1¼-in. wide. Flat base pressure blocks permit direct mounting; dovetail base blocks for channel mounting.

Buchanan Electrical Products Corp., Hillside, N. J.

Limit Switches (54)

A pair of new 2-circuit limit switches that are compact in size and have high electrical capacities is now available. Precision limit switches include a roller-plunger-actuated switch and a push or in-line-plunger-actuated switch. Roller-plunger switch, 5LSI, which is especially effective for cam or slide operations, can be rotated 90° from switch cover plate. Plunger actuated switch, 2LSI, offers a full ¼ in. of overtravel. Both are completely sealed. Contact arrangements are double throw 2-circuit, single-pole double break. A single-pole double-throw unit can be obtained by tying together one normally-open and one normally-closed terminal and using this as a common terminal.

Micro Switch, Freeport, Ill.

Thermostat (55)

A new room thermostat with contemporary straight-line appliance styling, has been announced for domestic heating and air conditioning systems. Squared to blend with straight-line design requirement, the thermostat features bold-face temperature readings that are visible from across an average-size room. It measures 1⅜ in. thick, 2¼ high and 4⅜ in. wide. A companion control has also been introduced for controlling the cooling, heating and fan units in the home air conditioning system. The functional base attachment fits directly under the thermostat. One of its two switches turns the air conditioning heating or cooling unit on or off. The other has an "on" and "automatic" position for the fan. Both the thermostat and air conditioning control can be mounted as one unit on the wall surface. The complete single-pole, single-throw unit, is designated 3AAT-20.

Appliance Control Department, General Electric Co., Morrison, Ill.

Product Briefs

(56) The Acme Wire Co., New Haven, Conn., has redeveloped and improved their "AS" series cable **splice insulating kits.**

(57) Steber Manufacturing Co., Broadview, Ill., has announced a new group of ball-type **fixtures** for PAR-38, R-30 and R-40 sealed beam lamps. . . . (58) A new design of apartment house **mail boxes,** approved by the U.S. Post Office Department, which now makes it possible to remove large magazines and other mail from the individual tenants' compartments without tearing, has been introduced by the Auth Electric Co., Inc., 34-20 45th St., Long Island City 1, N. Y. . . . (59) Embedding tap or branch splices in epoxy resin is now possible using a new **splicing kit** added to the "Scotchcast" brand resin splice line by Minnesota Mining and Manufacturing Co., 900 Bush Ave., St. Paul, Minn.

(60) Jasper Blackburn Corp., St. Louis, Mo., has replaced the cellulose acetate covering of its pre-filled **clamps** with a coating of clear, "see-thru" plastic molded to clamps by the Auto-Vac process.

BRONCO CERTIFIED 66
Neoprene Control Cable
BUILT FOR HEAVY DUTY SERVICE WHERE AN EXTRA FLEXIBLE MULTIPLE CONDUCTOR ELECTRICAL CABLE IS NEEDED

JACKET is certified by a registered professional engineer to contain not less than 67.32% Neoprene ...for maximum protection against oil, ozone, sunlight, flame, acids and alkalis. A signed certification is affixed to each reel.

BRANDED with complete data—name, type, size, number of conductors, rated voltage—every two feet, exactly; makes it the only cable that is self-measuring.

SYNCHRO-CURED—vulcanized by the exclusive patented BRONCO process. This, plus fine stranding, and special engineering, results in flexibility which is absolutely unique in cables of this size.

UP TO 36 CONDUCTORS. Bronco 66 Certified Portable Control Cable is made with from 5 to 36 conductors. It is also made with electronic shielding and in stationary types.

COLOR-CODED INSULATION. The high quality Buna S insulation around the single conductor is colored and striped in accordance with the NEMA code.

ORDER THE LENGTH YOU REQUIRE. IT WILL BE SUPPLIED AT NO ADDITIONAL COST.

SALES OFFICES IN ALL PRINCIPAL CITIES

16 LOCAL AND 3 CENTRAL SERVICE CENTERS THROUGHOUT THE COUNTRY ... OVERNIGHT SERVICE TO ANY CITY IN THE COUNTRY

WESTERN INSULATED WIRE CO.
America's fastest growing specialist manufacturer of portable electrical cords and cables
LOS ANGELES 58, CALIFORNIA

extra flexible HEAVY DUTY NEOPRENE

CONTROL CABLE

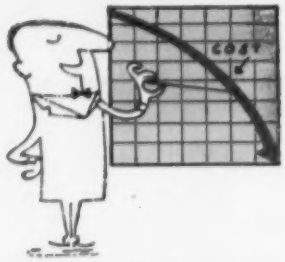
portable
electrical
CONTROL CABLE
with up to 30
conductors
protected by 67.32%
NEOPRENE jacket

BRONCO

CERTIFIED 66

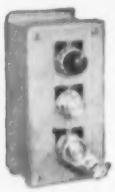
SAVE! WITH THE RIGHT CONTROL

There is a *right* Furnas Electric control for every job. Cost and space advantage can be yours by choosing the control designed for the motor.



Furnas Magnetic Starters are available through Size 4 in 10, instead of the usual 5, different sizes from 1 to 100 hp. This provides "In-Between" sizes, not otherwise available, at corresponding price and space advantages.

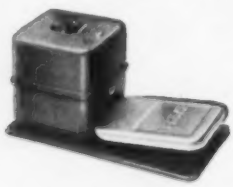
Drum Controllers—over 1000 models available from 1 to 10 hp. for whatever application you require.



Oil Tight Push Buttons for every need. Standardization and interchangeability mean more combinations with fewer parts. Complete accessory line.

Pressure Switches

Limit Switches



Foot Switches

FOR MORE INFORMATION WRITE FOR BULLETIN 5411, 1067 McKEE ST., BATAVIA, ILLINOIS

A28

FURNAS ELECTRIC COMPANY
BATAVIA, ILLINOIS
SALES REPRESENTATIVES IN ALL PRINCIPAL CITIES

CATALOGS and BULLETINS

(61) CARBON BRUSHES—43 questions and answers for getting better performance. Bulletin GEA-6688, 8 pages. General Electric Co.

(62) STANDBY GENERATORS for emergency electric power. 4-page brochure describes standard models available with complete specifications; photos illustrate units from 7.5 to 200 kw. Katolight Corp.

(63) CABLE SPECIFICATIONS. New up-to-date "Red Book" containing specifications for municipal communications control, signal and power cables used for police communications, traffic systems and fire alarm systems as approved by the International Municipal Signal Association. 208 pages. Kaiser Aluminum & Chemical Sales, Inc.

(64) DIESEL POWER UNITS ranging from 60 to 76 and from 115 to 200 hp. Diagrams, cross sections, exploded views and photos illustrate design features of 4- and 6-cylinder units. International Harvester Co.

(65) METALLIC SHEATHED CABLE for utilities, chemical plants and oil refineries, paper and pulp industry, and general industrial construction. 4-page folder describes new C-L-X liquid- and gas-tight, crush-resistant metallic sheath with sealed-in cable. Simplex Wire & Cable Co.

(66) FOOTSWITCH which is waterproof, dustproof, oilproof and rustproof and available either SPDT momentary contact or SPDT maintained contact is described in 2-page bulletin. Linemaster Switch Corp.

(67) TWO-WAY RADIO equipment for mobile use is described in 38-page booklet ECR-497, completely covering a wide range of equipment designed to fit individual needs based on present FCC rulings. General Electric Co.

(68) HIGH VOLTAGE CABLE sheathed with thermoplastic Roseal. 4-page bulletin RCD 700 includes rating, scope of use, conductor construction, insulations and shielding of available cables rated up to 15,000 volts. Rome Cable Corp.

(69) HIGH-FREQUENCY CAPACITORS. Bulletin GEC-1346B, 6 pages, includes performance data on 53 separate ratings of class HF water-cooled capacitors suitable for

Assure safe, "worry-free" splices by using tapes that are cable compounds . . .

In a safe, "worry-free" splice, the wall of electrical insulation around the connector is built up with a tape made with a cable insulation compound. The sheath, an extension of the cable's protective covering, is composed of a weather-, chemical- and abuse-resistant tape made with a cable sheathing compound. In other words, the splice . . . far from being a weak link in the cable . . . can be every bit as reliable.

Okonite splicing tapes are true cable compounds. The same ingredients are used in both. For example, Okolite Tape is made of the same basic compound as Okolite high voltage cable insulation. Okoprene Tape corresponds to the service-proved Okoprene cable sheath. Both of these materials—Okolite and Okoprene—have been specified by leading industrials for over 20 years.

Free samples of the Okonite Tapes are yours for the asking. Write to "Tape Dept., The Okonite Co., Passaic, N. J." and you'll promptly receive a trial kit containing a roll of Manson Friction Tape, Okonite Low Voltage Insulating Tape, Okolite High Voltage Insulating Tape, and Okoprene Sheathing Tape.

YOUR COMMUNITY'S LEADING ELECTRICAL WHOLESALER IS THE AUTHORIZED DISTRIBUTOR OF OKONITE QUALITY TAPES.

where there's electrical power . . . there's **OKONITE CABLE**

5607

These new 4700 Series Grounded "Twist-Lock" units are polarized to prevent interchange with regular 125-volt "Twist-Lock" devices. An elbow-shaped grounding slot prevents insertion of regular "Twist-Lock" caps, accepting 4700 Series caps only. With 4700 Series "Twist-Lock" units there is absolutely no danger of plugging into a 3-phase circuit by accident.

Write today, for complete information.

HARVEY HUBBELL, INC.

HIGHEST QUALITY
WIRING DEVICES • MACHINE SCREWS

DEPT. D BRIDGEPORT 2, CONNECTICUT

WIRING DEVICE WAREHOUSE LOCATIONS

Scarborough, Ontario, Can. 1160 Birchmount Road
Bridgeport 2, Connecticut State and Bostwick Streets
Chicago 7, Illinois 37 South Sangamon Street
Los Angeles 12, California 103 North Santa Fe Avenue
San Francisco, California 1675 Hudson Avenue
Dallas 7, Texas 1111 Dragon Street

power-factor improvement in circuits operating from 500 to 12,000 cycles. General Electric Co.

(70) HIGH-FREQUENCY LIGHTING progress is surveyed in booklet consisting of four papers covering theory, generation, and applications. The Wakefield Co.

(71) INTERLOCK CONNECTORS. Complete line of Hubbell self-locking, quick-disconnect connectors, panel jacks, plugs and terminal strips for wire sizes ranging from No. 12 to 22 is described in new 24-page booklet. Avnet Interlock Sales Corp.

(72) MOTOR OPERATOR. Oil-submerged unit for proportioning control of dampers in heating, ventilating and air conditioning systems is described and illustrated in 2-page data sheet F-8354. Barber-Colman Co.

(73) TELEPHONE WIRE, cord and cable. Complete line is illustrated and described with specifications in new 22-page loose-leaf catalog. Whitney Blake Co.

(74) MOTOR CONTROLS. Bulletin 14B8507, 8 pages, covers front-access, high-voltage Type H starters for 2300 to 5000-volt motors. Unit uses roll-out type air-break contactor for easy inspection and maintenance. Allis-Chalmers Mfg. Co.

(75) TURBINE-GENERATORS for metals reduction plants, pulp and paper mills, petrochemical installations and electric utilities. 54-page catalog gives complete detailed information on medium-sized units. GEA-3277D. General Electric Co.

(76) SMALL LAMP SOCKETS for all electrical requirements. 28-page catalog S-557 details complete line of units including candelabra bayonet sockets, neon lamp sockets, plug-button mounting sockets, and widely used incandescent types. Leecraft Mfg. Co., Inc.

(77) PLUG-IN BUSWAY. New 1957 28-page catalog No. 10 describes complete system of plug-in distribution including feeder lengths, plugs, tees, elbows, hangers and other fittings, together with detail drawings and layout diagrams. Electric Distribution Products, Inc.

(78) ELECTRICAL SPECIALTIES. Line of Levolier switches, industrial sockets and portable lamp guards is condensed into 32-page pocket-size catalog. Included are equipment photos, descriptions and catalog numbers, with ordering information. McGill Mfg. Co.

(79) UNIT SUBSTATION TECHNICAL LIBRARY, GET-2753, consisting of seven individual publications, presents approximately 100 pages of data on technical design and economics of unit substations and their control. General Electric Co.

(80) CABLE SPLICING KITS. 4-page bulletin describes method of insulating joints in rubber, neoprene, lead and aluminum-sheathed cables on 5000 volts or less. Acme Wire Co.

(81) HIGH-CYCLE M-G SETS for high-frequency lighting. 400-cycle, 20-kw synchronous motor-generator set equipped with magnetic amplifier type voltage regulator and starter is described in 4-page bulletin MG 9-57. Also included is standard line up to 200 kw. Kato Engineering Co.

(82) CLEANING SOLVENT for wipe or dip-cleaning of greasy and oily parts of electrical equipment is detailed in technical bulletin. Harco Chemical Co.

(83) WIRE, CABLE AND CONDUIT guide. New 6-page technical bulletin includes information on insulation and sheathing materials, bare and weatherproof wires, magnet wires, building wires, service cables, and other cable and cords for power, lighting and control applications, as well as conduit and E. M. T. Bulletin RCP-100. Rome Cable Corp.

(84) SATURABLE REACTORS. New 32-page bulletin F-8383 discusses uses, characteristics, application and control of saturable power reactors, together with theory, formulas and typical wiring diagrams. Barber-Colman Co., Wheelco Instrument Div.

(85) 2-WAY RADIO antennas, accessories and towers for vehicular applications. Catalog 457, 40 pages, illustrates and describes complete equipment, with discussion of design techniques. Communication Products Co., Inc.

(86) POWER TRANSFORMERS. 40-page booklet GEA-6604 gives performance data, prices, outline drawings, dimensions and weights for typical ratings from 5000 to 50,000 kva, 69 to 138 kv. General Electric Co.

(87) FIRE ALARM SYSTEMS for every type of property from small schools, hospitals and nursing homes through office buildings, public and private institutions to large industrial installations. 45-page catalog. Autocall Co.

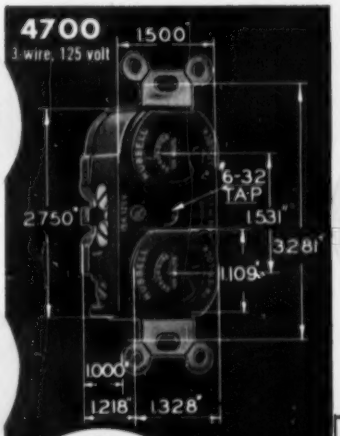
ANNOUNCING
A COMPLETE NEW LINE

IT PAYS TO HAVE GOOD CONNECTIONS
HUBBELL

Twist-Lock®
approved for GROUNDING purposes only.

A COMPLETE NEW LINE . . . NON-INTERCHANGEABLE with REGULAR "TWIST-LOCK" UNITS

4700
3-wire, 125 volt



3-WIRE, 15 AMP., 125 VOLT

FOR APPLICATIONS that require POSITIVE GROUNDING plus POSITIVE LOCKING.

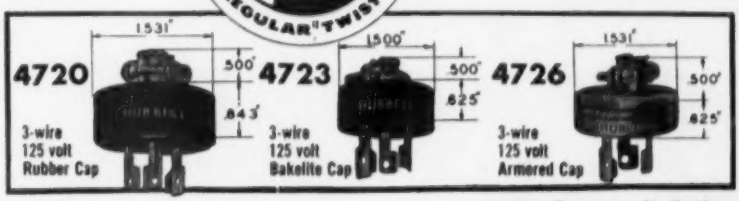
GREEN HEXAGONAL GROUNDING SCREW.

ALL UNITS IN DISTINCTIVE BROWN COLOR.

3-wire, 125 volt
4730
Connector Body

NON-INTERCHANGEABLE WITH REGULAR "TWIST-LOCK"

Elbow-shaped grounding slot prevents insertion of regular "Twist-Lock" caps. Accepts 4700 Series Caps only.



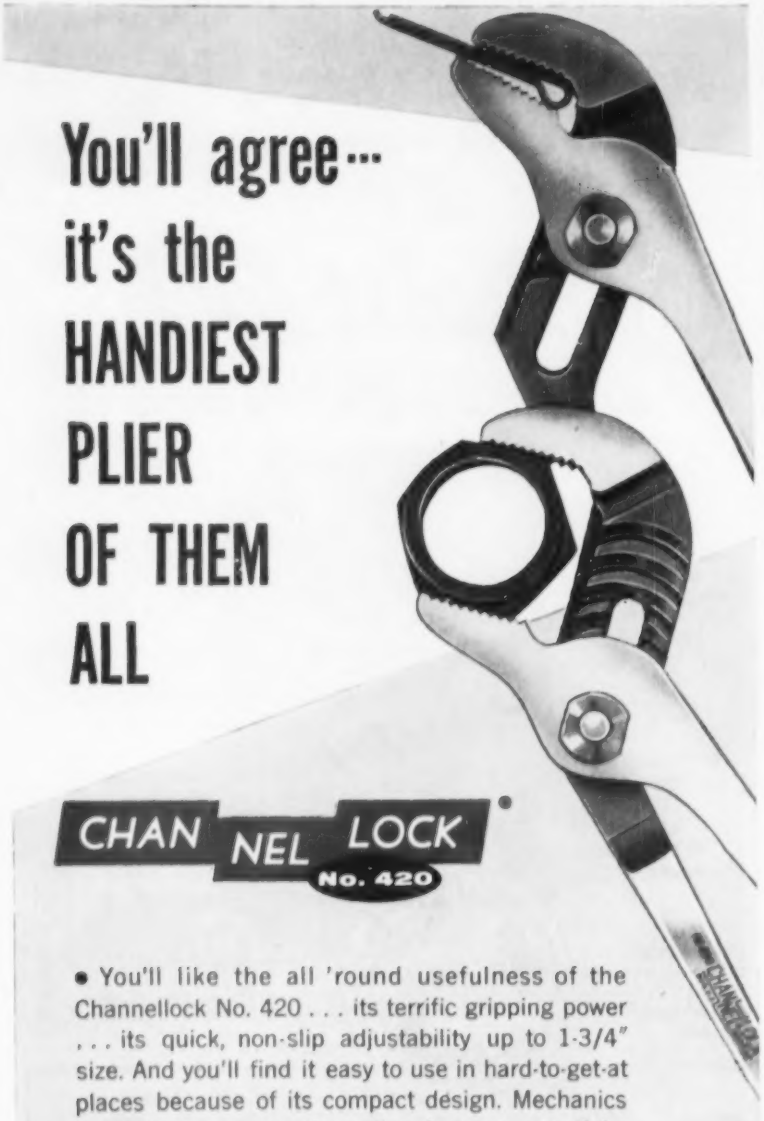
write for new bulletin.

FIRST . . . and still the FINEST!

HARVEY HUBBELL, INC.
HIGHEST QUALITY
WIRING DEVICES • MACHINE SCREWS

DEPT. C-1 BRIDGEPORT 2, CONNECTICUT

WIRING DEVICE WAREHOUSE LOCATIONS
Scarborough, Ontario, Can. 1160 Birchmount Road
Bridgeport 2, Connecticut State and Bostwick Streets
Chicago 7, Illinois 37 South Sangamon Street
Los Angeles 12, California 103 North Santa Fe Avenue
San Francisco, California 1675 Hudson Avenue
Dallas 7, Texas 1111 Dragon Street


You'll agree···
it's the
HANDIEST
PLIER
OF THEM
ALL
CHAN NEL LOCK
No. 420
• You'll like the all 'round usefulness of the Channellock No. 420 . . . its terrific gripping power . . . its quick, non-slip adjustability up to 1-3/4" size. And you'll find it easy to use in hard-to-get-at places because of its compact design. Mechanics everywhere say no other plier does so many jobs so well. You'll say so, too!
CHAMPION DeARMENT TOOL COMPANY • MEADVILLE, PA.
ASK YOUR TOOL SUPPLIER FOR CHANNELLOCK PLIERS
Be sure it's a genuine CHANNELLOCK
Look for the trademark on the handle

(88) SYNCHRONOUS MOTOR CONTROLS. Bulletin GEA-5873B, 8 pages, discusses features and applications, describes motor operation, and gives illustrated examples. General Electric Co.

(89) SWIMMING POOL LIGHTS. New pool light for wet niche installation in concrete, tile, metal, Fiberglas or plastic is described in new bulletin, which also covers underwater floodlights. Revere Electric Mfg. Co.

(90) RESIDENTIAL LIGHTING. New 40-page pocket-sized booklet, "How to Work Wonders with Light", presents illustrated solutions to home lighting problems and many ideas for decorating with light. Lightolier, Inc.

(91) MASTER SWITCH. Bulletin GEA-6706, 8 pages, provides detailed information on new line of surface- and desk-mounted heavy-duty master switches. General Electric Co.

(92) MASTER SWITCHES. Bulletin GEA-6706, 8 pages, provides detailed information on new line of surface- and desk-mounted heavy-duty master switches for industrial applications. Second bulletin, GEA-6705, 2 pages, provides information on a lighter, general-duty master switch. General Electric Co.

(93) CATHODIC PROTECTION CABLES for maintenance of underground pipelines and other buried or underwater metallic structures. Two types of cable, both available with either copper or aluminum conductors are described in 4-page bulletin RCP 1110. Rome Cable Corp.

(94) WELDING CONTROL. Bulletin GET-2683, 12 pages, furnishes electrical and mechanical information on standard components comprising non-synchronous welding control. General Electric Co.

(95) INTERVAL TIMERS for specific control applications, with 1% accuracies. Bulletin AWH RC-300 describes this hermetically sealed unit. A. W. Haydon Co.

(96) SYNCHRONOUS GENERATORS for hydro-electric generation of power. 24-page bulletin PB 2800-1 illustrates and describes two vertical types with additional data on excitation. Elliott Co.

(97) CIRCUIT BREAKERS, panels, multi-outlet assembly, switches, switch-gear assemblies, trolley duct and busways are included in new 1958 "Marketeer" with new price lists. 80 pages. BullDog Electric Products Co.

New Sears, Roebuck and Co. Store at Nashville has 178,961 sq ft of floor space. All wiring is protected by SPANG HD and SPANGLEAM EMT.

59,000 ft of SPANGLEAM EMT, 77,170 ft of SPANG HD went into this store. Easy handling of conduit saved time, kept costs down.

"SPANG® Conduit's easy handling saved us installation time"

says Mr. Leon Harlan, Ramsey Electric Co., Nashville, Tennessee

"We installed 77,170 ft of SPANG HD Galvanized Conduit and 59,000 ft of SPANGLEAM EMT to protect the wiring in the new Sears, Roebuck & Co. store at Nashville, Tennessee," reports Mr. Harlan. "Because it was so easy to work with, we saved considerable time on installation which also helped keep costs down.

"SPANG HD was easy to cut and thread. Bending was fast and accurate. The conduit was clean and free of burrs and obstructions which otherwise might have caused trouble on wire pulling.

"We used SPANGLEAM EMT for short runs, and we had good results with it, too. The EMT was delivered bundled with blue plastic tape instead of rope. This was an important safety factor, because the tape makes a strong bundle and lengths don't slip out of place."

You get top quality with SPANG

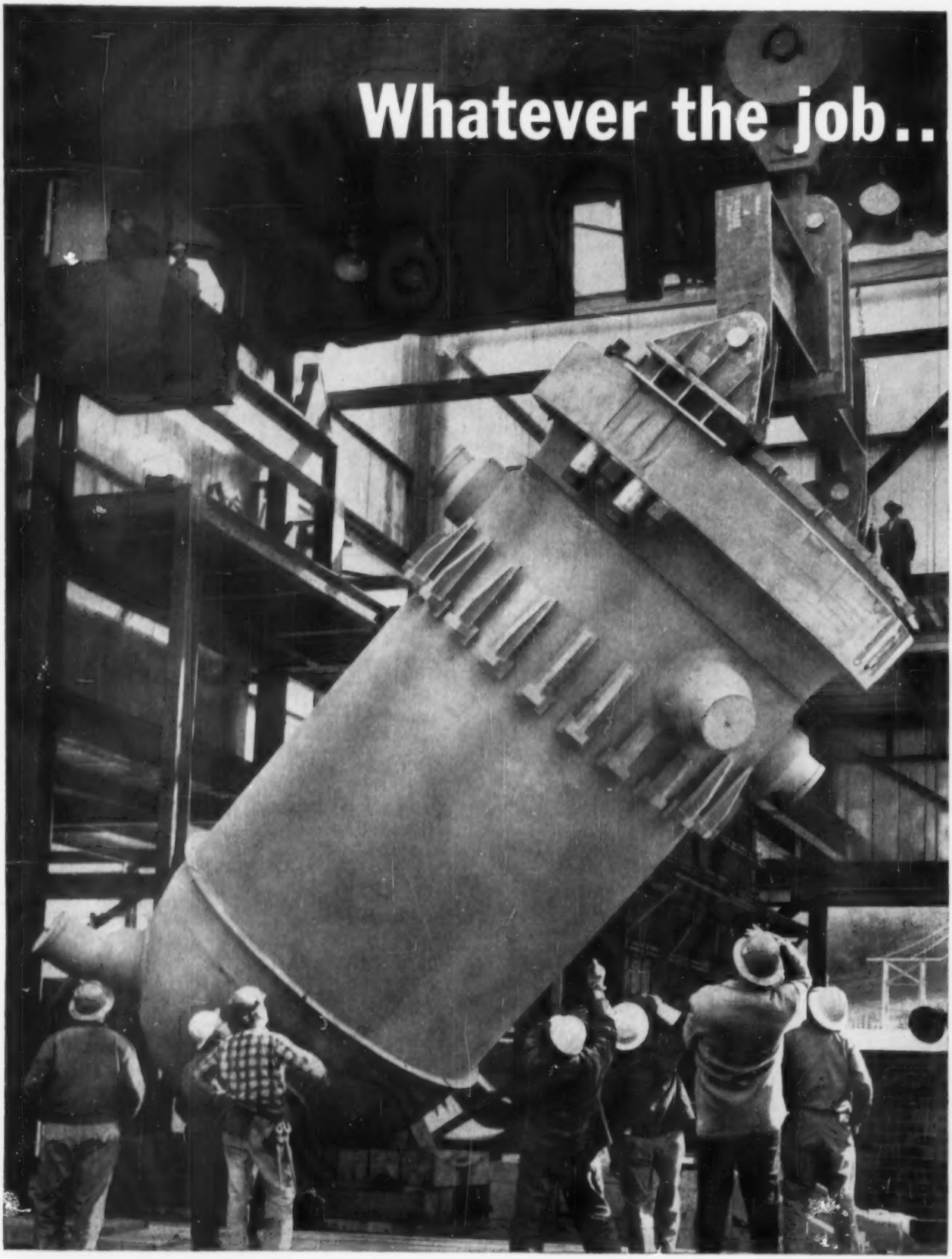
. . . because SPANG Conduit is made under *quality-control* conditions, and is tested and inspected before shipping to be sure you get a quality product every time.

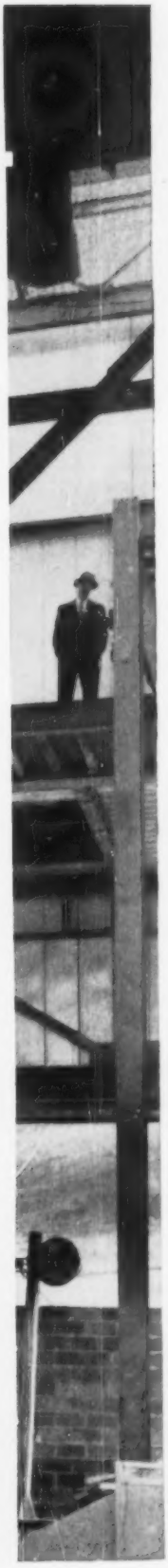
If you've never tried SPANG, now's the time to start. Order it for your next job. You'll get quality service from your local SPANG Distributor, too.

Architect Engineers:
Stevens & Wilkinson, Atlanta, Georgia
General Contractor:
Foster & Creighton, Nashville, Tennessee
Electrical Contractor:
Ramsey Electric Company
Nashville, Tennessee
Spang Distributor:
Tennessee Valley Electric Supply Co.
Nashville, Tennessee
Harris-Patrick Electric Supply Co.
Nashville, Tennessee

SPANG CONDUIT

SPANG-CHALFANT
Division of The National Supply Company
GENERAL SALES OFFICE
TWO GATEWAY CENTER, PITTSBURGH, PA.
District Offices and Sales Representatives in Principal Cities


Whatever the job..



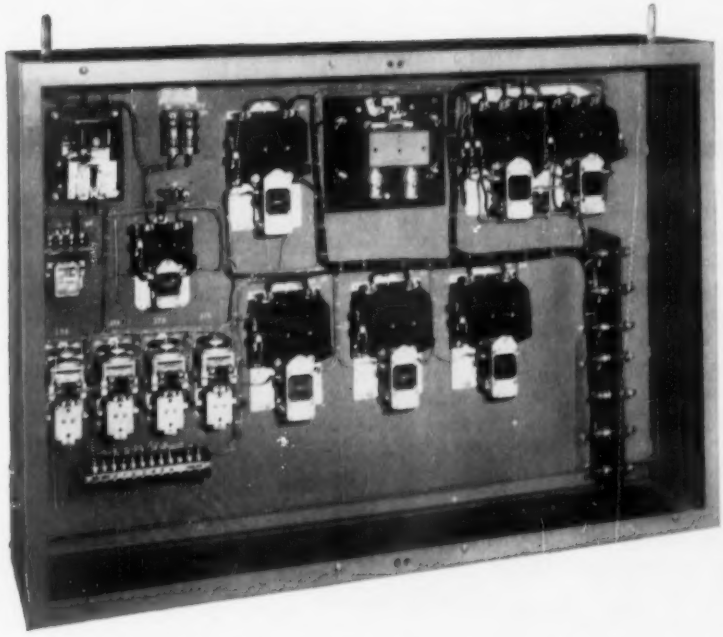
you need Westinghouse Load-O-Matic . . . the modern precision crane control

You may never need to handle anything as delicate as this atomic reactor, but the one really up-to-date means of controlling your a-c crane for any duty is the Westinghouse LOAD-O-MATIC® control.

LOAD-O-MATIC utilizes static reversing, thus doing away with troublesome reversing contactors. The stepless feature of LOAD-O-MATIC, effective down to and including zero speed, eliminates the necessity for old-fashioned "inching" or "jogging" and permits infinite speed control in spotting loads. These features also cut maintenance costs by as much as 60 percent over conventional crane control.

The LOAD-O-MATIC system utilizes the drive motors for electric braking, greatly increasing the life of mechanical holding brakes and cutting crane operating costs. Precision, economical LOAD-O-MATIC can be utilized on any crane . . . at only slightly higher cost than old-fashioned crane control. For complete information, see your Westinghouse sales engineer. Or write Westinghouse Electric Corporation, P.O. Box 868, 3 Gateway Center, Pittsburgh 30, Pa. J-22072

YOU CAN BE SURE...IF IT'S Westinghouse



CONTROL PANEL OF LOAD-O-MATIC is easily accessible, with front wiring throughout. Devices included are rugged, industry-tested Westinghouse units.

Ahead with the leaders

For your *Security*...

Cutler-Hammer has pioneered the development of many vital electrical control components for aircraft. The dependable performance of this equipment in the best of today's military and commercial planes contributes directly to your security.

For your *Health*...

Dependable Cutler-Hammer Motor Control makes the modern water supply or sewage disposal plant a model of quiet efficiency and impressive cleanliness, a steadfast guardian of the public health.

For your *Comfort*...

Proper electric motor performance is the very heart of air conditioning and the leading manufacturers of such equipment, from small window-installed units to complete systems for huge buildings, use and recommend Cutler-Hammer Motor Control.

Electric motors and the control equipment which must direct and protect them have an astounding variety of jobs to do today. Modern aircraft and steel mills, for example, are poles apart in their needs. So are machine tools and air conditioning systems, sewage disposal plants and automobile assembly lines, oil well pumping and newspaper press drives. Each requires its own highly specialized control techniques and often control equipment just as highly specialized.

For sixty-five years Cutler-Hammer engineers have worked with the technical men of *all* industries on the specialized needs in motor control. In industry after industry they have been in the forefront of progress for decades, forever ahead with the leaders. It is logical that Cutler-Hammer Motor Control is so frequently the specified choice of both designers and users of specialized equipment where dependable performance is so important! And it is also most logical that you will find it pays to specify and insist on Cutler-Hammer whenever you order control.

Cutler-Hammer Three-Star Motor Control sets three new cost-cutting standards: installs easier, works better and lasts longer. Featured by leading machinery builders. Stocked for your convenience by your nearby Cutler-Hammer Distributor.

CUTLER-HAMMER
MOTOR CONTROL
C-H

. . . CUTLER-HAMMER, Inc., 1306 St. Paul Ave., Milwaukee 1, Wisconsin. *Associate:* Canadian Cutler-Hammer, Ltd., Toronto.

Reader's Quiz

QUESTIONS from readers on problems of industrial equipment, installation, maintenance and repairs. Answered by electrical maintenance engineers and industrial electrical contractors out of their experience. For every question and every answer published we pay $5.00.

Impedance on Transformer Bank

QUESTION Y32—I would be interested in an explanation of the value of maintaining a given percentage of impedance on a 6 kv transformer bank.

The Utility Co. furnished the primary service from 3-1250 kva, 3-phase, 34.5 kv to 4.8 kv delta and specifies 6% impedance.

The 4800-volt, 3-phase primary feeder serves transformers for 480-volt, 3-phase power and 208Y/120-volt lighting which we specified for 5% impedance on all transformers. The kva per transformer ranges from 150 to 400 using 3-phase, 480-volt transformers for power and 3-phase, 4 wire, 208Y/120-volt transformer for lighting load.—G.E.L.

Answer to Y32: The reasons for specifying a given impedance for a particular transformer bank may be grouped under three general headings:

1) design factors
2) practical considerations
3) economics

From the designers viewpoint, short-circuit currents and voltage drops must be considered. High impedance transformers reduce short-circuit currents but increase voltage drop, particularly with poor power factor loads such as induction motors. Low impedance transformers on the other hand, while reducing voltage drop, may increase short-circuit currents so high as to require unreasonable switchgear for protection of the circuits fed by the transformer. Hence, a compromise is necessary and an average value is used which by general acceptance becomes the "standard". Higher impedance values are normally indicated for higher voltage and large transformers. It should be remembered that the lower the voltage, the more effective a small impedance is in limiting the short-circuit magnitude.

From a practical point of view, standardized transformers have many advantages. They are more readily obtainable from distributors on short notice and require fewer numbers for stock purposes at the user's plant. It is of considerable value, moreover, to have transformers of identical impedance where parallel operation is necessary to reduce circulating currents and to maintain proper regulation and load division.

The economics of transformer selection are dictated by practical considerations as well as the design requirements. Transformer manufacturers can reduce co by the repetitive manufacture standard transformers which can be utilized in most installations. Although they also supply transformers with impedances to suit the customers' special needs, it is customary to apply an additional charge for them. As the result of considerable study by the industry, NEMA, AIEE and others, standard ratings were selected, as for example, 6% impedance for single phase power transformers 25 to 34.5 kv within the range of 667 to 2500 kva; and 5 percent impedance for three-phase load center transformers with 600 volts maximum secondary voltage 201 to 500 kva. Except for the very lowest ratings, the value you mentioned falls within the ranges.—R.G.O.

Answer to Y32: It is probable that the Utility Company specified an impedance of 6% for the 3750 kva bank to provide a limitation of short circuit kva on the 4.8 kv circuit, or for reasons of standardization with other units on their system. The impedance of all circuit elements between a point of fault and the power source acts to limit the fault current. When the calculated fault current on a bus is slightly above or equal to the interrupting capacity of the circuit breakers it is either necessary to install larger and more expensive breakers or introduce more impedance to limit the fault current to a safe value. The power company would usually make these calculations and may have selected 6% impedance transformers accordingly.

However, the normal range of impedance of 1250-kva single phase, 34.5/4.8-kv oil-immersed self-cooled transformers is 5.5% to 7.0% with 6% being the usual design value. Therefore, I believe that the Utility specified 6% impedance only to insure the same impedance value for all units of the same rating so that they would share the load evenly in a 3-phase delta bank.

Since the distribution transformers are all listed as 3-phase units, they would not incur a problem of banking and the standard impedances of 5% may be used although it does not appear to be critical for this application. This would offer only a convenience to the operating and maintenance personnel in knowing that all units have 5% impedance.—L.D.B.

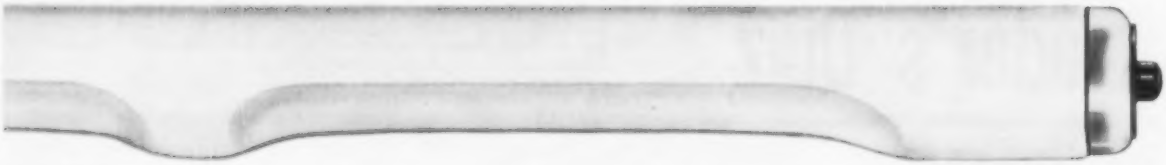
Motor Starters

QUESTION Z32—One of my fellow engineers stated that fusible wire of the proper size may be put in motor starters in place of the overload relay heaters whenever the proper size overload relay heaters are not available. He further stated that the wire size can be calculated in accordance with the following formula: $d = (I/a)^{2/3}$; where I = fusing current in amps; d = diameter of wire in inches; and a = constant; for copper, $a = 10{,}244$.

This seems contrary to the practice that I have followed for years. Will someone please explain the fallacy of the above; i.e., if one exists.—J.M.

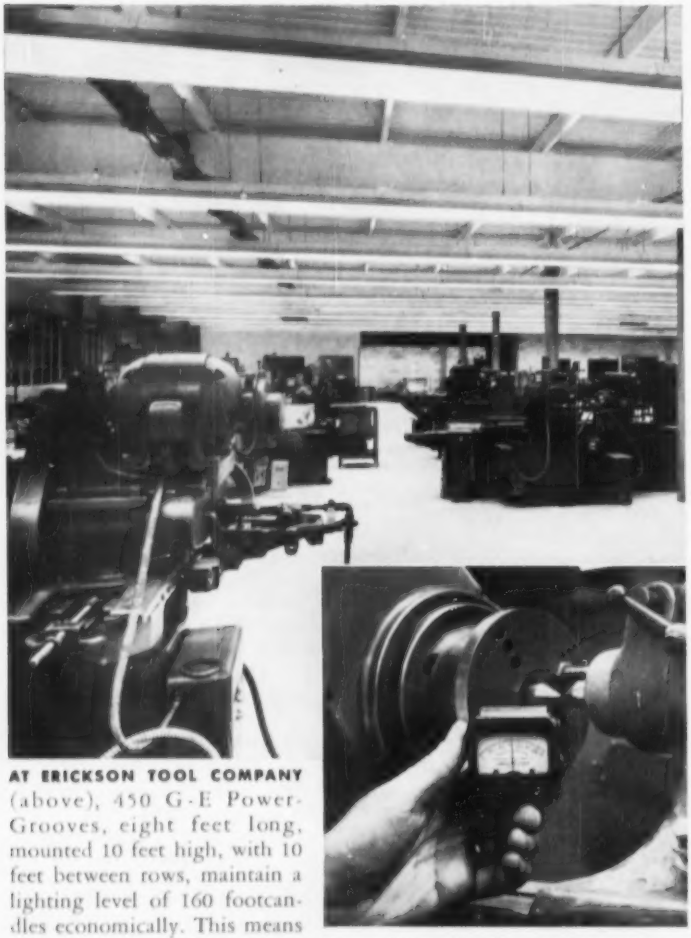
ANSWER TO Z32—The suggestion that "J.M." substitute fuse wire for the overload relay heaters is absolutely without basis in fact. A motor controller supplies short circuit and overload protection for the motor. The fuse is set for a high current value to pass the motor inrush current without damage. The overload relay is set low to detect currents of approximately 115% of full load current. If the fuse wire is sized for 115% of full load to protect the motor from overload, it will melt on motor inrush at starting. If the fuse wire is sized to pass the starting current, it is only duplicating the short circuit protection and will not see motor overloads until the motor has burned up and become faulted. While a "haywire" scheme of this type would permit the motor to run it will not adequately protect it and therefore should not be employed.—L.D.B.

ANSWER TO Z32—A wire having the same resistance, temperature coefficient, same melting point and located in the same place would be a good substitute. The current-time curve for a fuse wire is not the



The Powerful Power-Groove!

Radical new General Electric fluorescent lamp design can give your customers higher, more economical light levels



AT ERICKSON TOOL COMPANY (above), 450 G-E Power-Grooves, eight feet long, mounted 10 feet high, with 10 feet between rows, maintain a lighting level of 160 footcandles economically. This means there is plenty of light right at the machines (see footcandle reading at right)—where extra light means extra safety, extra accuracy for workers. No supplementary lighting is needed. Powerful Power-Grooves do it all!

While plans for their new building were still in the early stages, officers from Erickson Tool Company of Cleveland, Ohio, visited the Lighting Institute—General Electric's lamp headquarters at Nela Park. There they saw the whole array of lighting methods and discussed the powerful new G-E Power-Groove Lamps.

They were shown how these revolutionary lamps provide outstanding general lighting, making it unnecessary to use supplemental lighting on individual machines (like that used by Erickson toolmakers in their old plant). They saw how powerful Power-Grooves would fill a plant with pleasant light that's easy on the eyes . . . as well as the pocketbook. The decision was made: Erickson's new plant would have G-E Power-Groove Lamps throughout!

Because G-E Power-Groove Lamps give nearly twice as much light per tube as High-Outputs—2½ times as much as 8-foot slimlines—your customers can get more light per fixture—with fewer parts to maintain. And compared to other fluorescent systems, they can save 5-20% on their initial investment.

Get the whole exciting Power-Groove story. Write General Electric Co., Large Lamp Dept. ECM-127, Nela Park, Cleveland 12, Ohio. Better still, visit Nela Park and let us show you on-the-spot demonstrations of how the powerful Power-Grooves can work for your customers.

WORLD'S BRIGHTEST WORKSHOP—Now you can see powerful Power-Grooves in action . . . lighting the world's brightest workshop. It's at the G-E Lighting Institute at Nela Park. Plan to visit it and see for yourself.

Progress Is Our Most Important Product

GENERAL ELECTRIC

same as for a heater type overload or fuses—but would be a better substitution. An ordinary fuse of proper size would be better because it is protected against arcing. You would have to balance the possibility of faulty overload protection against loss of use of machinery due to shut down of motor until a proper heater could be obtained.—E.B.

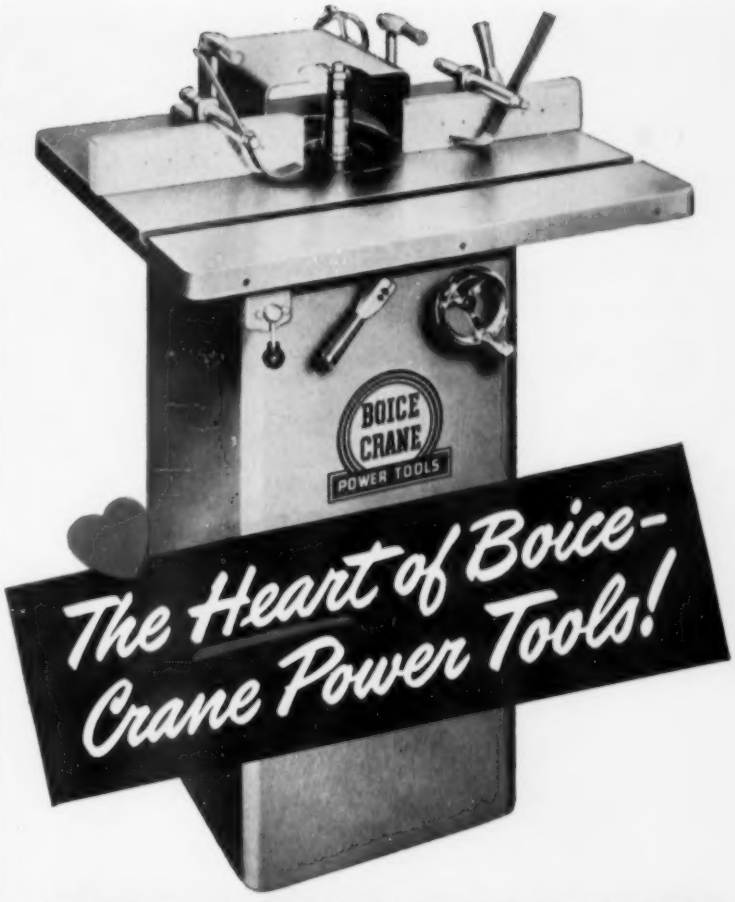
ANSWER TO Z32—The fallacy exists in trying to set up an empirical formula to figure a heater coil substitute. Different types of overload relays as produced by different manufacturers require different values of heat to actuate the bimetallic strips or melting alloys. What might work on the overloads of one type starter may not work on that of another manufacturer. I have found from experience that the safe thing to do, when heater coils are not available at time of installation, is fuse the circuit with Fusetrons of a rating equal to full load current of the motor; or if overloads are expected use a value equal to 112-115% full load rating. A straight fuse may also be used, equal to values given above, if some means is provided to short it out during starting. Any measure used should be done with precaution, and proper heaters should be installed as soon as possible. I have known companies who prefer using Fusetrons to starter overload relays—W.E.G.

Induction Motor

QUESTION A33—In a 3-phase, 480-volt ungrounded delta system, we have burned out a 10 hp, 3-phase induction motor three times. We are using two O.L. elements and they are of the proper size. Would a ground on the phase that does not have O.L. elements cause the burnout? Would a three-element O.L. help in spite of a ground? The ground detector lamps showed a ground, but by that time it was too late!—V.S.

ANSWER TO A33—Your problem is very interesting, in your report that the ground detecting lamps showed ground condition after the breakdown of the motor winding insulation.

I agree with you, that you should use a third thermal, on the unprotected leg of the 3-phase line. Where you have an ungrounded system, although it is a poor system, it may have to be kept in service.



BALDOR STREAMCOOLED MOTORS

For years famous Boice-Crane Power Tools have enjoyed a reputation for faultless performance. And for years, like hundreds of other leading manufacturers, Boice-Crane has specified and depended on Baldor Streamcooled Motors to maintain its enviable prestige.

This remarkable reputation for motors of uncompromising quality, is why Baldor consistently delivers out-of-the-ordinary performance under the most rugged conditions—a performance record proven in over a third of a century of service.

Rear view of Boice-Crane Spindle Shaper showing vertical installation of Baldor Streamcooled Motor.

Write for Catalogs on Complete Line!

Baldor ELECTRIC CO.

4353 Duncan Ave. St. Louis 10, Missouri

Over 400 Authorized Sales & Service Distributors in U. S. A.

District Offices: Atlanta • Chicago • Cincinnati • Cleveland • Dallas Des Moines • Detroit • Indianapolis • Litchfield, Conn. • Los Angeles Milwaukee • Minneapolis • New Orleans • New York N. Kansas City, Mo. • Oakland • Philadelphia • Portland, Ore.

Announcing—the new, improved

New sturdier construction! New heavier jacket! Improved Sealtite* E.F. offers new superior performance in equipment . . . new installation ease. No extra cost!

Sealtite Type E.F.†—the original flexible, liquid-tight conduit, first to meet J. I. C. standards—is now better than ever. New design has made it stronger, tougher, more durable in service . . . easier to install.

Over-all construction is improved. Heavier extruded PVC jacket offers greater resistance to abrasion, cutting and tearing . . . greater oil resistance . . . greater holding power for fittings.

It is more flexible—permits smaller bending diameters. New convenient markings save time, prevent waste. Length is indicated by arrows at 1-foot intervals. Trade size in inches is also shown on cover.

Available in handy cartons, or nonreturnable reels,

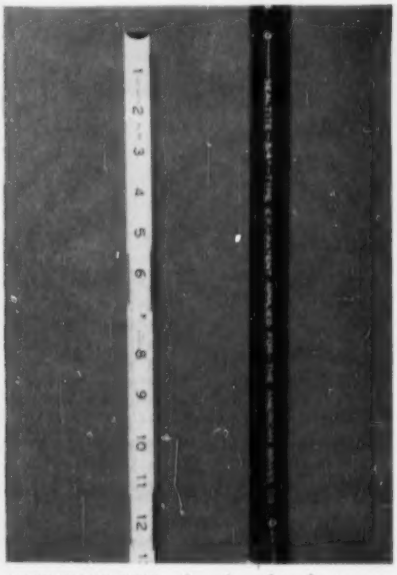
STRONGER. Over-all construction is stronger, more durable.

TOUGHER. Thicker PVC jacket resists abrasion, cutting, and tearing.

MORE OIL RESISTANCE. Liquid-tight jacket keeps out all foreign matter.

GREATER HOLDING POWER FOR FITTINGS – easier attachment.

GREATER FLEXIBILITY – smaller bending diameters – smoother cover even when flexed.



NEW MARKINGS – length and trade size are indicated at 1-foot intervals.

Sealtite E. F. flexible, liquid-tight conduit

at no extra cost. Reels simplify handling and cutting, reduce scrap, simplify storage, have handy charts for a running inventory.

Sealtite types E.F. and U.A. (U.A. is approved by Underwriters' Laboratories) in both black and machine tool light gray. For information, write: The American Brass Company, American Metal Hose Division, Waterbury 20, Conn. *Trademark †Pat. Applied For 57199

Insist on the conduit marked

SEALTITE

an ANACONDA® product

full of life

thanks to **CHAMPION LIGHTMANSHIP**

OVER 200 INSPECTIONS—

just one example of how Champion applies LIGHTmanship to make sure your customers get all the light they pay for. Checks and counter checks at every step of production guard them against early burn-outs and early dim-outs when you install Champion lamps.

CHAMPION Lamps

CHAMPION LAMP WORKS

LYNN, MASSACHUSETTS

A Division of Consolidated Electric Lamp Co.

MILLIONS OF LAMPS A YEAR . . .

ONE PLANT Standard of Quality Control

Your maintenance problems are greater with ungrounded system than with grounded system. However, all your motors should be Meggered (insulation test) periodically and maintain a system whereby you can see at a glance which motor will be subject to a break-down—thereby having this motor condition corrected.

If it were in your power to aid this condition for the better, I suggest that you ground *all* motor frames and conduits with your water mains. This ground wire size depends upon the capacity of the service—thusly—protects your operators from shocks and helps you with your maintenance.—O.C.

ANSWER TO A33—A three element relay would give more complete protection. If a ground comes on ahead of the overload relay of one phase and a second ground comes on the winding of the motor on the phase which has no relay protection then the motor is unprotected and that winding will burn out. Protecting all three phases is the only solution unless motor is disconnected when first ground comes on and the ground removed before the motor is placed back in service. An audible ground detector could be noticed instantly whereas a visual type is only noticed when you happen to be looking at it. A relay type ground detector could be connected to trip out motor switch when ground comes on.—E.B.

ANSWER TO A33—First of all, a motor will fail if the potential gradient of the insulating material has been exceeded. This can occur for two reasons: 1, on ungrounded delta systems, an intermittent ground can cause overvoltages many times the line voltage depending upon the capacitance and inductance of the line from the point of "infinite bus" to the fault; 2, the insulation could deteriorate due to normal age or could be broken down by a moist or caustic atmosphere. Improper baking after winding could permit wire motion due to magnetic torques and cause insulation damage.

Now to answer your questions in the order presented. A ground on that phase that does not have an O. L. element would never cause the burnout unless, and this is important, there exists another ground on the system elsewhere on one of the other two phases. The answer to the second question is NO, since the ground already exists rendering the motor useless.—J.M.

FREE

THIS 12" SAMPLE OF ALCOA ALUMINUM CONDUIT

ALCOA RIGID CONDUIT IS EASIER AND MORE ECONOMICAL TO INSTALL,

SAY CONTRACTORS

The contractors who installed the electrical system in Alcoa's 30-story office building and in every new Alcoa plant erected in the past ten years agree on this point.

> Aluminum rigid conduit installs easier, faster and at lower cost than any other!

Alcoa® Aluminum Electrical Rigid Conduit is easier to cut . . . easier to bend . . . easier to thread.

It weighs two-thirds less than steel . . . which makes it easier to handle, less costly to ship, easier to stockpile at job site.

From the long-range viewpoint, there are other savings:

> No staining or corrosion . . . and no painting
>
> Up to 20% less voltage drop
>
> Greater safety in hazardous locations . . . because aluminum is nonsparking

Alcoa Rigid Conduit has Underwriters' Laboratories approval. Suitable fittings are available. And adequate stocks are maintained throughout the country by Alcoa distributors.

Why not get all the facts on this timesaving, more profitable conduit? The coupon below will bring you complete literature and a generous sample.

THE ALCOA HOUR
TELEVISION'S FINEST LIVE DRAMA
ALTERNATE SUNDAY EVENINGS

Aluminum Company of America
2327-M Alcoa Building
Pittsburgh 19, Pa.

Please send literature on *Alcoa Aluminum Electrical Rigid Conduit* and a one-foot sample.

Name_____

Title_____

Company_____

Address_____

City and State_____

Electrician saves twice with *Ramset*® fastening tools!

Here is how Harrington Electric Co. used Ramset and Shure-Set® on new Cleveland building

Harrington electricians use powder-actuated RAMSET to fasten overhead strip lights, firing anchors into beams wherever needed. No pre-drilling or setting. Fasteners and charges are carried in the pocket of the operator's RAMSET apron.

Another Harrington electrician fastens floor conduit with his hammer-in SHURE-SET tool. Drives like a nail, holds like an anchor, in concrete subfloor.

Other contractors also using RAMSET products on this 23-story office building: The Feldman Bros. Co.; Korner Sheet Metal Co.; Geo. A. Fuller Co.; Johnson Service Co.; The Gellin Acoustical Co.; Smallwood Plastering Co.; E. J. Brandt Co., Inc.; and Builders Structural Steel Corp.

Ramset Fastening System

WINCHESTER-WESTERN DIVISION
OLIN MATHIESON CHEMICAL CORPORATION

12105-L BEREA ROAD CLEVELAND 11, OHIO

Can You Answer These QUESTIONS

QUESTION L33—Is it good practice to ground steel framing of the plant, as well as instrument casings and transformer tanks, etc., on the same ground bus as generator neutrals?—G.J.P.

QUESTION M33—We have in our plant a 900 hp, 4160-volt, 3-phase, 60 cycle wound rotor motor driving a compressor in our food freezer plant. The load on this motor fluctuates widely, and sometimes rapidly. Visual inspection of the rotor and rotor resistors indicates definite overload, yet the stator current does not verify this condition.

We would like to know if there are any instruments with which we could measure the rotor currents and also the power developed in the rotor, keeping in mind that the rotor frequency varies from 60 cycles at standstill to a few cycles at full speed. Further, we would like to know the method necessary to accomplish the above.—J.M.

QUESTION N33—In our plant distribution system, conduits have been considered satisfactory as a means of grounding utilization equipment in accordance with the National Electrical Code. We have been told, however, that certain other plants install a green ground wire inside the conduit from equipment back to the panel and then to ground. Can someone explain whether this is a necessary or desirable arrangement?—R.G.O.

QUESTION P33—On an installation we are planning, we are going to have a molded case circuit breaker, 3-pole frame L 600 amps. We will use the above on a 208-volt, 3-phase, 4-wire system. When checking the interrupting rating of this circuit breaker, the Underwriters rate it at 10,000 amps, while the NEMA rating is 50,000 amps. Why is there such a great difference in the two ratings for the same breaker?

Is the above circuit breaker suitable for the main breaker if it is fed by three 25-kva transformers on 208 volts, 3-phase, 4 wires?—M.D.

PLEASE SEND IN YOUR ANSWER BY JANUARY 15

Wheeler ULTRA-NEW

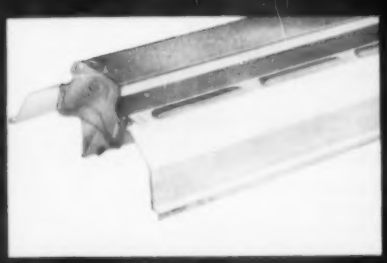
POWER-LUME

gets the most out of the new

POWER-GROOVE

LAMPS

POWER-LUME F



POWER-LUME V

Distributed exclusively through electrical wholesalers.

Delivers **TWICE** the amount of lumen output per foot of lamp length!

Today's big news in industrial lighting. 2 outstanding Wheeler units — Power-Lume F and Power-Lume V — specifically designed to utilize *fully* the extra illuminating power of the new Power Groove Lamp. Both fixtures are designed for all medium to high mounting applications . . . provide more comfortable seeing, cooler lamp operation, thanks to Wheeler's unique diffuser apertures that direct MORE than 20% of the light upwards.

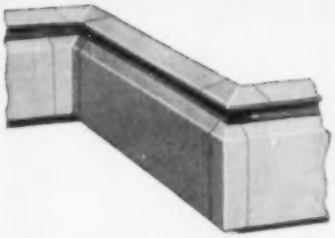
POWER-LUME F (porcelain reflectors) are ideal for use where rough work is being performed and shielding is unimportant. Where reduced brightness is required, Power-Lume F with aluminum reflectors does the job best.

POWER-LUME V (with drawn one-piece porcelain reflectors) with increased shielding is the perfect lighting answer for those areas where more difficult seeing tasks are being performed. For maximum seeing comfort, Power-Lume V with drawn one-piece aluminum reflector is recommended.

Write for New Product Data Sheet No. 100 D
NEWEST UNIT IN WHEELER'S "PACKAGE PLAN" LIGHTING

WHEELER REFLECTOR CO. (Division of Franklin Research Corp.)
275 Congress St., Boston, Mass.

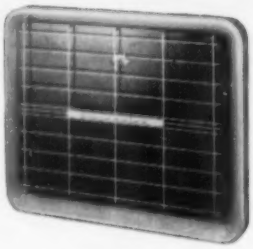
ELECTRIC HEAT...
Are you growing with this fast moving market?



Chromalox Baseboard Heater

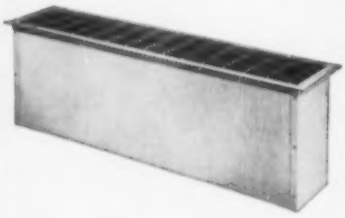
Chromalox
Electric Unit Ventilator

Chromalox
Automatic Wall-Insert Heater



Chromalox
All-metal Radiant Panel

Chromalox In-Duct Heater



Chromalox Floor Drop-in Heater

Chromalox Hi-Flow Portables

Cash in with Chromalox
the complete quality line

No doubt about it—electric heat is gathering speed everywhere—finding new uses in homes, churches, factory offices, schools, motels—everywhere that heat is needed for comfort.

Not only new structures, but existing structures, use this modern method of heating. And this doubles your market.

Electric utilities, too, are devoting promotional time to developing this huge market. Are you tying in?

Why not learn the electric heating story now? Write for full details. You'll find nation-wide distribution and local Chromalox engineering assistance to back your efforts.

You'll like the Chromalox line, too—renowned for quality the world over, yet it costs no more. With quality, there's customer satisfaction, without call-back for you. Long life, fast installation, attractive appearance—are all in your favor with Chromalox.

Write now—so that you can

HEAT BETTER—ELECTRICALLY

C-2209

Chromalox Electric Heat

Edwin L. Wiegand Company

7637 Thomas Boulevard, Pittsburgh 8, Pennsylvania
CHurchill 2-6400

See our complete line in Sweet's Catalog

Questions on the Code

Answered by:
B. A. McDONALD, *New York Board of Fire Underwriters, Rochester, N. Y.*
GLENN ROWELL, *Electrical Engineer, Fire Underwriters Inspection Bureau, Minneapolis, Minn.*
B. Z. SEGALL, *Consulting Electrical Engineer, New Orleans, La.*

Wiring Recessed Fixtures

Q. *Section 4179-b of the Code, covering recessed fixtures, requires an outlet box to be placed at least 1-ft from the fixture so that a change may be made from the 60-degree circuit conductor to a fixture conductor of a higher operating temperature. Does the Code permit this outlet box to serve other outlets on the circuit? See diagram.—E.S.M.*

A. I do not believe there is any Code violation involved with the procedure shown by the diagram, provided the splices in the outlet box are accessible when the fixture is removed from its fixed location. This Code rule however has been the source of considerable discussion over many years on the basis of the following Code rules;

Section 3717. Junction boxes shall be so installed that the wiring contained in them may be rendered accessible without removing any part of the building, sidewalks or paving.

Comment: Since it is not necessary to remove any part of the building structure to obtain access to the junction box, there appears to be no violation of this Code provision. Field experience indicates however, when the fixture is removed, it may be difficult to obtain access to the splices in the junction box unless the box itself may be drawn near the opening for the fixture. This usually involves the necessity for sufficient slack in the raceways or cables concerned so that the box may be moved about one foot.

Section 3707. Boxes . . . shall be securely fastened in place.

Comment: In order to satisfy this Code provision, it would be necessary to attach the box to the building structure. Some Inspectors however have accepted the so-called floating type of box which lays unsupported back of the ceiling finish. Access to such a box is readily attained by pulling the assembly over to the fixture opening. This method is questionable in view of the provisions of Section 3707. If however the box were fastened to the building structure so that the 1-ft clearance is assured; and so arranged that it may be readily detached when access to joints is necessary, it appears that the intent of the code would be satisfied.—B.A.McD.

Low Voltage Control

Q. *Would you say that the "Remcon" individual low voltage residential control system, and the General Electric group low voltage residential control system are both under Class 2 remote control systems in every case?—R.W.K.*

A. It is my understanding that both of these systems of low voltage control are designed to satisfy the code requirements for a Class 2 remote control and signal system, as covered by Section 7281; and both systems are approved by Underwriters' Laboratories for such use, subject to limitations with respect to the nature and size of the load. Both systems are derived through energy-limiting transformers, so that the power is limited to satisfy the provisions of Section 7281. I do not know of any new development which would take either system, as we have come to know them, out of the Class 2 category. These systems of control are not limited to residential occupancies, but there appears to be a distinction between the two with respect to the loads served.

According to the latest U.L. listings available through the 1956 U.L. listings with bi-monthly supplements through February 1957, I find that the Remcon, combination relay and transformer device, listed under the name of the Pyramid Instrument Corp., is rated as follows:

"Cat. No. R-120, maximum ratings: Single phase ½ hp. 10 amps, 120-volt, 60-cycle, for installation in outlet boxes."

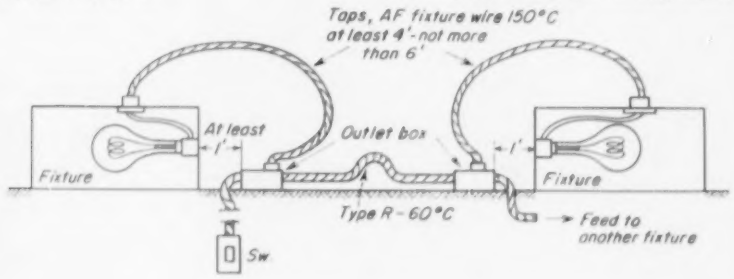
"Cat. No. R-277, 277-volt, ac: 125-volt, ac; 10-amp, 277- volt ac; control of electric discharge lamp loads at full rated amp."

The General Electric relays have U.L. ratings as follows:

"Cat. No. R R 2, maximum ratings: Single phase, 1 hp, 15-amp, 125-volt, ac; 10-amp, 227-volt ac; suitable for control of tungsten-filament lamp loads not exceeding 15 amps, 125-volt, ac; suitable for control of electric discharge lamp loads not exceeding 15-amp, 125-volt, ac, 10-amp, 277-volt, ac."

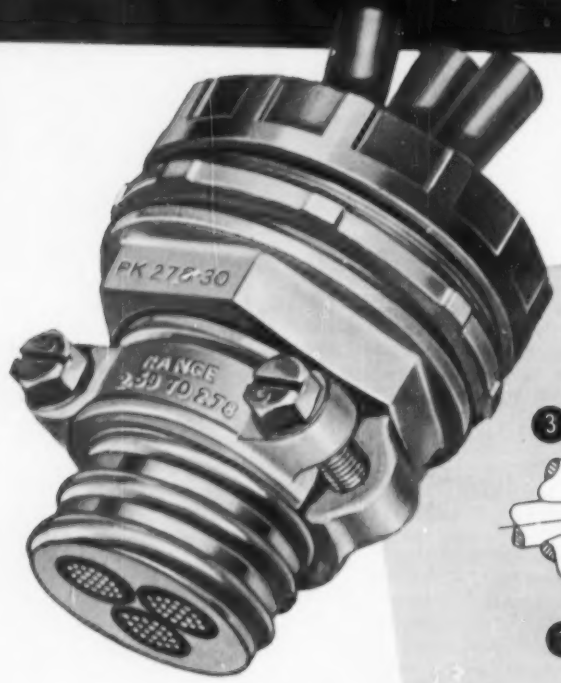
"Cat. No. RR 3, maximum ratings; single phase, 1 hp, 125-volt, ac; 20 amp, 277-volt, ac; suitable for control of tungsten-filament lamp-loads not exceeding 20-amp, 125 volt, ac; suitable for control of electric discharge lamp loads not exceeding 20-amp, 277-volt, ac."

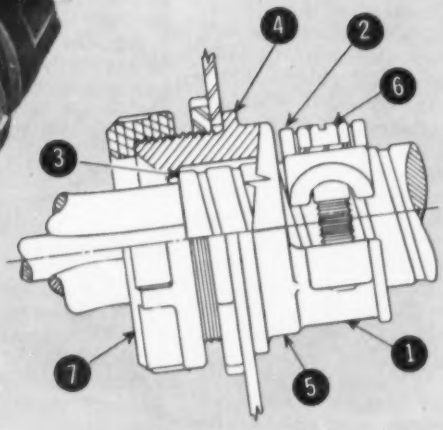
With the rapid development of our industry, it is possible that the above quoted maximum U.L. ratings have been increased since the February 1957 bi-monthly supplement was issued, and in order to avoid any misconception with respect to ratings as they exist at the moment, I recommend that both the manufacturer and the U.L. be consulted for the latest developments.—B.A.McD.



from every angle–

O.Z. TYPE "PK" is the clamp





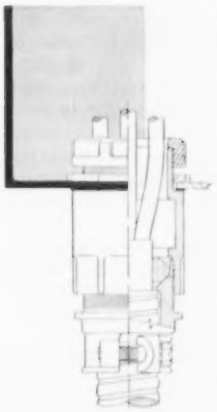
1. Special Aluminum Alloy body and clamping cap for strength and corrosion resistance.
2. Armor clamped several turns from end.
3. Smooth armor stop assures termination at proper point—protects cable insulation from sharp, rough edges.
4. Flange on body eliminates locknut outside of cabinet.
5. Large hex facilitates installation.
6. Slotted hex-head clamping bolts can be tightened by wrench or screwdriver.
7. Strong O.Z. Type A hi-impact phenolic insulating bushing.

Here is a clamp designed specifically to meet the requirements of interlocked armor cable applications. The O. Z. Type "PK" Clamp provides exceptional speed and ease of installation, whether your cable enters the cabinet from the top, bottom or side. It is available for interlocked armor cable ranging in size from .45" to 4.28" O. D.

for ARMORED CABLE

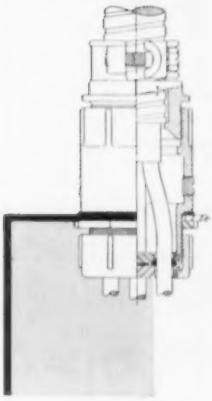
combines with standard O.Z. fittings for any terminating or splicing job involving INTERLOCKED ARMOR CABLE.

Seals cable ends to protect insulation against moisture and other contaminators—can also be used with threaded hubs and bosses to provide watertight cable entrances.



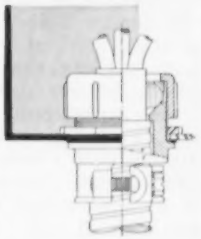
TYPE "PKC"

Compound type terminator for interlocked armor cable entering bottom of cabinet.



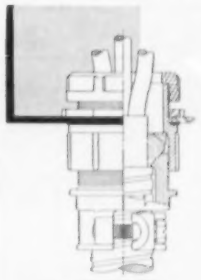
TYPE "PKT"

Compound type terminator for interlocked armor cable entering top of cabinet.



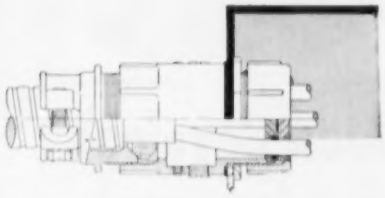
TYPE "PKG"

Sealing gland type terminator for interlocked armor cable entering a cabinet.



TYPE "PKS"

Provides watertight cable entrance seal in any position. Can also be used as a compound fitting in upright position.



TYPE "PKH"

Compound type terminator for interlocked armor cable entering side of cabinet.

TYPE "PKJ"

Splicing fitting for interlocked armor cable.

For complete information on these and other O. Z. Fittings for use with Interlocked Armor Cable, write for Engineering Bulletin 135A.

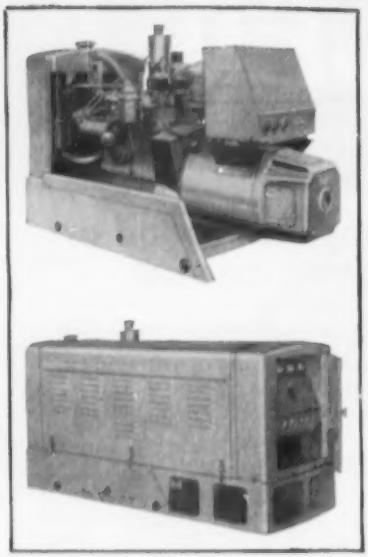
O.Z. ELECTRICAL MANUFACTURING CO., INC.

262 BOND STREET • BROOKLYN 17, N. Y.

Sales Office and Warehouse: 406 So. Cicero Avenue, Chicago 44, Ill. • ESterbrook 9-0326
Office and Factory: 749 Bryant Street, San Francisco 7, Calif. • GArfield 1-7846

- CAST IRON BOXES
- CABLE TERMINATORS
- POWER CONNECTORS
- SOLDERLESS CONNECTORS
- GROUNDING DEVICES
- CONDUIT FITTINGS
- INTERLOCKED ARMOR CABLE FITTINGS

Onan
ELECTRIC PLANTS
ELECTRIC PLANT
NEWS



Onan develops new low-cost standby plants

Water-cooled units in 10 and 15 KW sizes meet rigid requirements

A new series of water-cooled electric plants makes Onan reliability and advantages available at significantly lower prices. The new units are powered by the same rugged, industrial-type engines used on more expensive plants. They have close inherent voltage regulation, operate on either gas or gasoline, and are equipped with all necessary controls and instruments, and high water temperature cut-off. Standard Onan accessories are available.

The Onan revolving armature, all-climate generator is direct-connected and self-aligning. All standard voltages are available. Both sizes are offered unhoused or with handsome weatherproof steel housings.

Write for specifications

Onan
ELECTRIC PLANTS

D.W. ONAN & SONS INC.
2933 University Avenue S.E.
Minneapolis 14, Minnesota

Service Disconnects—Multiple Occupancy

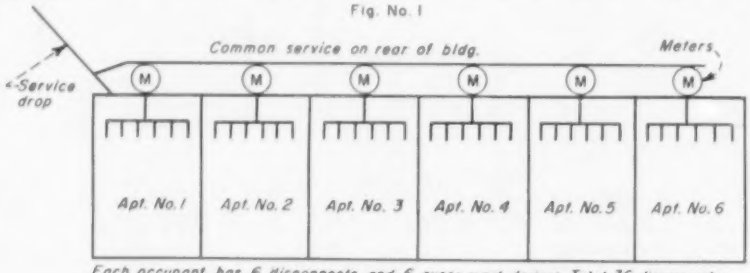
Q. *According to the code, I believe the service installation shown by Fig. No. 1 is correct. When we group these switches at one common location, as shown by Fig. No. 2, do we revert back to the six subdivisions rule for the entire building? In the building in question there are only six apartments but if there were more than six would it be necessary to install a main switch for the entire installation; or could we use a main switch for each apartment; or could we use six switches for each apartment as shown by Fig. No. 1? The building is one story high. Our inspector contends that there is a question of code violation, and a switch or switches would be required on Fig. No. 2.*—A.M.S.

A. According to the provisions of Section 2351-b and 2371-a-4, each occupant of a multiple-occupancy building shall have access to his service disconnecting means and overcurrent protective devices; and when the building does not have occupancy above the second floor, service conductors may be run to each occupancy in accordance with Section 2301-b and each such service may have not more than six switches or circuit-breakers. In accord with the foregoing, there is no code violation involved with the installation shown by Fig. No. 1, and there is no limitation with respect to the number of apartments involved.

In connection with the installation shown by Fig. No. 2, I do not believe there is any conflict with the intent of the code. In this case, we have all of the service equipment grouped in a common location accessible to all of the occupants of the building. There is considerably less unprotected service conductors involved, and from a standpoint of hazard I am unable to visualize the distinction which would necessitate the installation of a main switch at point X or main switches for each apartment at the points marked with an asterisk. This reasoning applies not only to a building with six or less apartments but also to one which may have more than six apartments.

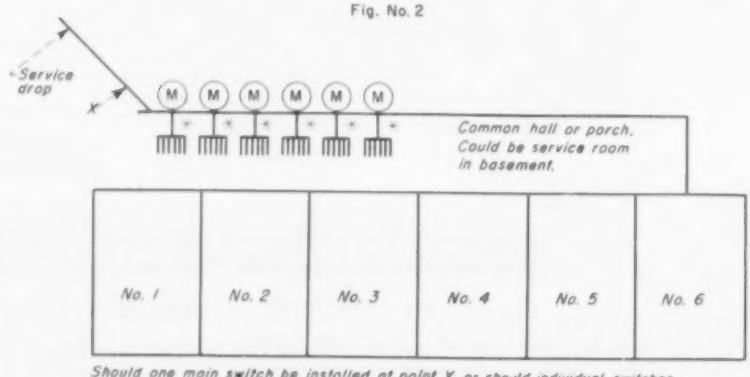
It may be argued that the specific conditions, under which such procedure is recognized by the code, are not satisfied by Fig. No. 2, since the service conductors do not run to each apartment. They terminate outside each apartment, and the service equipment is not located in each apartment but in a common location accessible to all occupants. On this basis, the inspector is correct in questioning the rule, but it is my personal opinion that there is no code violation. Perhaps however the code should clarify the issue raised. In support of this contention I call attention to the specific

Fig. No. 1



Each occupant has 6 disconnects and 6 overcurrent devices. Total 36 disconnects. One story building.

Fig. No. 2



*Should one main switch be installed at point X, or should individual switches for each apartment be installed at *. One story building.*

Allen-Bradley Line of MOTOR CONTROL *includes Both!*

D.C.

RELAYS AND CONTACTORS

Bulletin 200, Type G Relay. Rated: 5 amp, 64 v; 2 amp, 125 v; 0.5 amp, 250 v.

Bulletin 202 Contactor, Size 2, 1 Pole. Rated: 50 amp, 115-230 v.

D.C. relays are made with up to 8 poles. Also universal types, having contacts changeable from N.O. to N.C.—or vice versa—by merely reconnecting the terminals. Up to and including the 150 ampere rating, D.C. contactors are of the solenoid type; beyond this rating, up to and including 600 amperes, the clapper type construction is used.

ACROSS-THE-LINE STARTERS

Bulletin 600, Form 52, double pole only, open type. Max rating: ⅓ hp, 115-230 v.

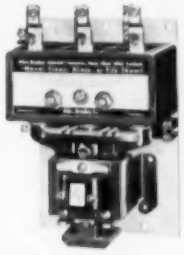
Bulletin 209, Form 2. Max rating: 1½ hp, 115 v; 2 hp, 230 v.

D.C. manual starters have a rugged, snap action mechanism that prevents contact "teasing" and thus prolongs contact life. D.C. manual and solenoid starters have maintenance free, double break, silver alloy contacts. Motor overload protection is reliable.

A.C.

RELAYS AND CONTACTORS

Bulletin 700, Type C. Rated: 10 amp, 550 v max.



Bulletin 702, Size 2, 3 Pole. Rated: 50 amp, 550 v max.

A.C. relays are made in different types for various applications, with up to 8 poles. The universal type, having contacts changeable from N.O. to N.C.—or vice versa—is very popular. The A.C. solenoid contactors, made in 9 ratings up to 900 amp, 550 v max., will satisfy any service requirement. Silver alloy contacts are used throughout the D.C.-A.C. solenoid relay and contactor lines.

ACROSS-THE-LINE STARTERS

Bulletin 600 in general purpose enclosure, complete with reliable overload breaker. Rated: 1 hp, 110-220 v.

Bulletin 709, Size 1. Rated: 7½ hp, 220 v; 10 hp, 440-550 v. Same general construction for max ratings of 300 hp, 220 v, 600 hp, 440-550 v.

All Allen-Bradley A.C. motor control is equipped with silver alloy contacts which are always in good operating condition. Because all A-B solenoid starters have only one moving part, trouble free performance and long life are automatically assured. It is the basic reason for Allen-Bradley's "quality" reputation.

A-B QUALITY

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.
In Canada: Allen-Bradley Canada Ltd., Galt, Ont.

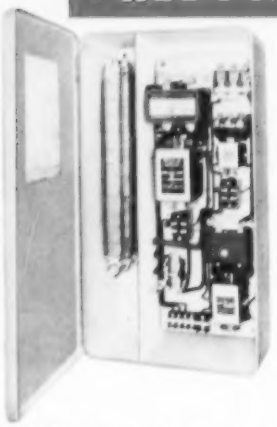
15-57-MR

...and more

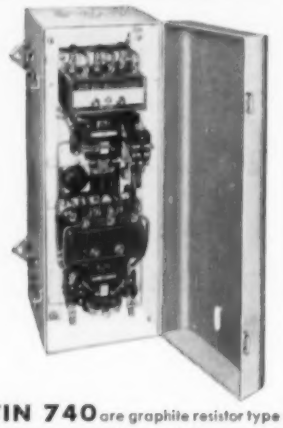
Allen-Bradley MOTOR CONTROL

D.C. | A.C.

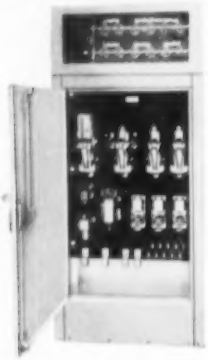
REDUCED VOLTAGE STARTERS



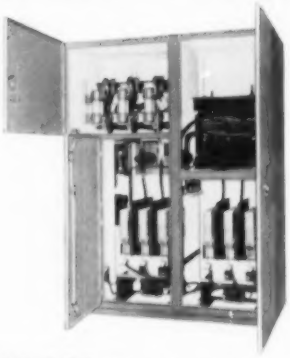
BULLETIN 267 are time limit, resistor type starters for automatic acceleration of constant speed shunt and compound wound D.C. motors. Solenoid contactors used up to and including Size 4 ratings. Max ratings: 75 hp, 115 v; 150 hp, 230 v.



BULLETIN 740 are graphite resistor type starters for automatic acceleration of squirrel cage A.C. motors. Made with 1 or 2 points of acceleration. Can provide velvet smooth acceleration for squirrel cage motors. Max ratings: 200 hp, 220-440-550 v.



BULLETIN 268 are time limit resistor type starters for automatic acceleration of adjustable speed shunt and compound wound D.C. motors. Designed for heavy duty service. Both Bulletin 267 and 268 starters available with or without dynamic braking feature, and also for reversing service. Max ratings: 75 hp, 115 v; 150 hp, 230 v.



BULLETIN 983 high tension starter illustrated above is of the reactor type, intended for starting synchronous motors. Available as an autotransformer reduced voltage starter; also in the across the-line construction. The heavy duty, solenoid air break contactor assures long, trouble free life. Max ratings: 1500 hp, 2300 v; 2500 hp, 4600 v. at 0.8 P.F.

The Allen-Bradley *quality* line is *not* limited to alternating current motor control. A companion line of direct current motor control is available with the same outstanding *quality* . . . the same reliability . . . the same ability to "take it." Both lines are described and listed in our latest A-B Handy Catalog, and our trained field engineers will also be glad to help you with your control problems.

You cannot make a mistake when you insist on Allen-Bradley control.

A-B QUALITY

ALLEN-BRADLEY

SOLENOID MOTOR CONTROL

QUALITY

Allen-Bradley Co.
1316 S. Second St., Milwaukee 4, Wis.
In Canada: Allen-Bradley Canada Ltd., Galt, Ont.

13-57-MR

provisions of Section 2351-b concerning buildings with occupancy above the second floor. In such cases the code specifically limits the service disconnects to six. When there is no occupancy above the second floor this limitation apparently is removed. Otherwise the third sentence of Section 2351-b should be revised to read as follows:

"Multiple-occupancy buildings that do not have individual occupancy above the second floor, *and which do not have a common accessible location for each occupants service equipment* may have service conductors run to each occupancy, etc."—B.A.McD.

Class 2 Location

Q. *We plan to do some wiring in a building in which dried milk powder will be packaged. Will such a building or room be considered as a Class 2 location and require the special types of electric wiring and fixtures?—O.F.*

A. Yes, any building or room in which dried milk powders are handled, processed or packaged would be considered as a Class 2 dusty location requiring the special type of electrical treatment as is specified under Article 500 for Class 2 locations. The United States Department of Agriculture in their Technical Bulletin No. 490 rate dried milk powders as follows: Dried whole milk as 4, dried skim milk as 7, and dried buttermilk as 5. The figures indicate the relative hazard of the various powders; in other words, a powdered material which will pass a 200 mesh screen that will not combust has been given a rating of 0 while the material having the greatest degree of combustion has been given a rating of 10. For comparison purposes, soybean meal dust is rated as being equivalent to that of dried whole milk while the dust common to a grain elevator handling wheat is given the same rating as that of dried skim milk.—G.R.

Grouping Motors—One Branch Circuit

Q. *Paragraph b-3 of Section 4343 of the National Electric Code appears to require the use of fuses only for branch circuit protection where two or more motors*

TRYING TO BOOST YOUR SHARE OF SOUND SYSTEM JOBS?

...be sure you're getting all this RCA help

1. RCA School Sound Systems

2. RCA "Arena Size" Sound

3. RCA Hotel Sound Systems

4. RCA Sound in Industry

5. RCA Church Sound Systems

Your bids on sound systems have a way of turning into sound system jobs when you work with RCA. You're much more likely to wind up each installation profitably, too. RCA's long standing reputation for dependability in sound backs up the quality of your own work. So, before you bid on another set of sound specifications, be sure you have the appropriate RCA Sound brochure on hand. They're shown at right . . . and the coupon brings your copies. Your RCA Engineered Sound Distributor can be a big help in planning acoustically correct systems which will enhance *your* reputation and net you more profitable sound business. He's in the classified directory under "Public Address and Sound Systems."

RADIO CORPORATION of AMERICA
Sound Products Camden, N. J.
In Canada: RCA VICTOR Company Limited, Montreal
Tmk(s) ®

Radio Corporation of America
Dept. A-61, Building 15-1, Camden, N. J.
Please send the RCA Sound brochures checked below.

☐ (1) ☐ (2) ☐ (3) ☐ (4) ☐ (5)

Name ..... Title .....
Company .....
Address .....
City ..... Zone ..... State .....

SAVE
costly motor rewinds

PROTECT
valuable switch gear
and transformers

PREVENT
fire damage and
personnel injury

with this
ELECTRONIC
WARNING DEVICE
for 440 v. 3-phase
ungrounded systems

When a ground develops you are warned immediately if your system is protected with the DELTA-DESCO GROUND ALERT. A bright RED light flashes on and a BELL inside the instrument starts to ring. The red light continues to burn until the ground is corrected and the bell rings until switched off. When the system is ground-free a GREEN light burns continuously.

Low cost. Simple operation. Portable or stationary models.

Don't wait until trouble strikes.

WRITE FOR DESCRIPTIVE BOOKLET
—TODAY!

DELTA-DESCO COMPANIES
DELTA ENGINEERING SALES CO.
539 Aero Drive
SHREVEPORT,
LOUISIANA

For use
with
440 v.
3-phase
ungrounded
systems

DELTA-DESCO
Electronic
GROUND ALERT

of any rating are connected on one branch circuit.

Are circuit breakers precluded from use as branch circuit protection under this provision of the code and, if so, why?—H.J.G.

A. The 1955 report of the Electrical Correlating Committee, NFPA Electrical Section, records the following action taken by Panel No. 11 which covers Article 430 of the N. E. Code.

"PROPOSAL: Remove restrictions from Sections 4343-b-3 and 4343-b-4 which require fuses instead of circuit breakers for a group of motors. Proposal from the field".

Recommendation of Panel: Make no change in this Section.

It is quite evident from the foregoing that the above code provisions precludes the use of circuit breakers. While Panel No. 11 expressed no comment in support of their action, it appears evident that the special provisions of Section 4343-b are woven around the use of fuses for branch circuit protection since no standards have been developed by U. L. covering motor starters, suitable for use for group installation, with circuit breakers in the branch circuit. In other words, the relationship between the branch circuit fuse and the motor-running overcurrent device has been established for fuses and not for circuit breakers.—B.A.McD.

Lightning Protection Devices

Q. *We are now in the process of planning the conversion of a fair sized grain elevator from rope drive to individual motor drive. This elevator will be served from a primary distribution system with the transformers to be located in the old powerhouse which is some 50 ft distant from the elevator proper. Secondaries to the elevator will be run underground. If lightning protective devices are provided on the incoming primaries at this substation, will it be necessary to provide surge protection at the point of entrance to the elevator proper of the secondary conductor?*—*A.D.E.*

A. In my opinion surge protection in the elevator proper would not be necessary inasmuch as Section 5053 provides that this protection is required within the elevator from overhead supply sys-

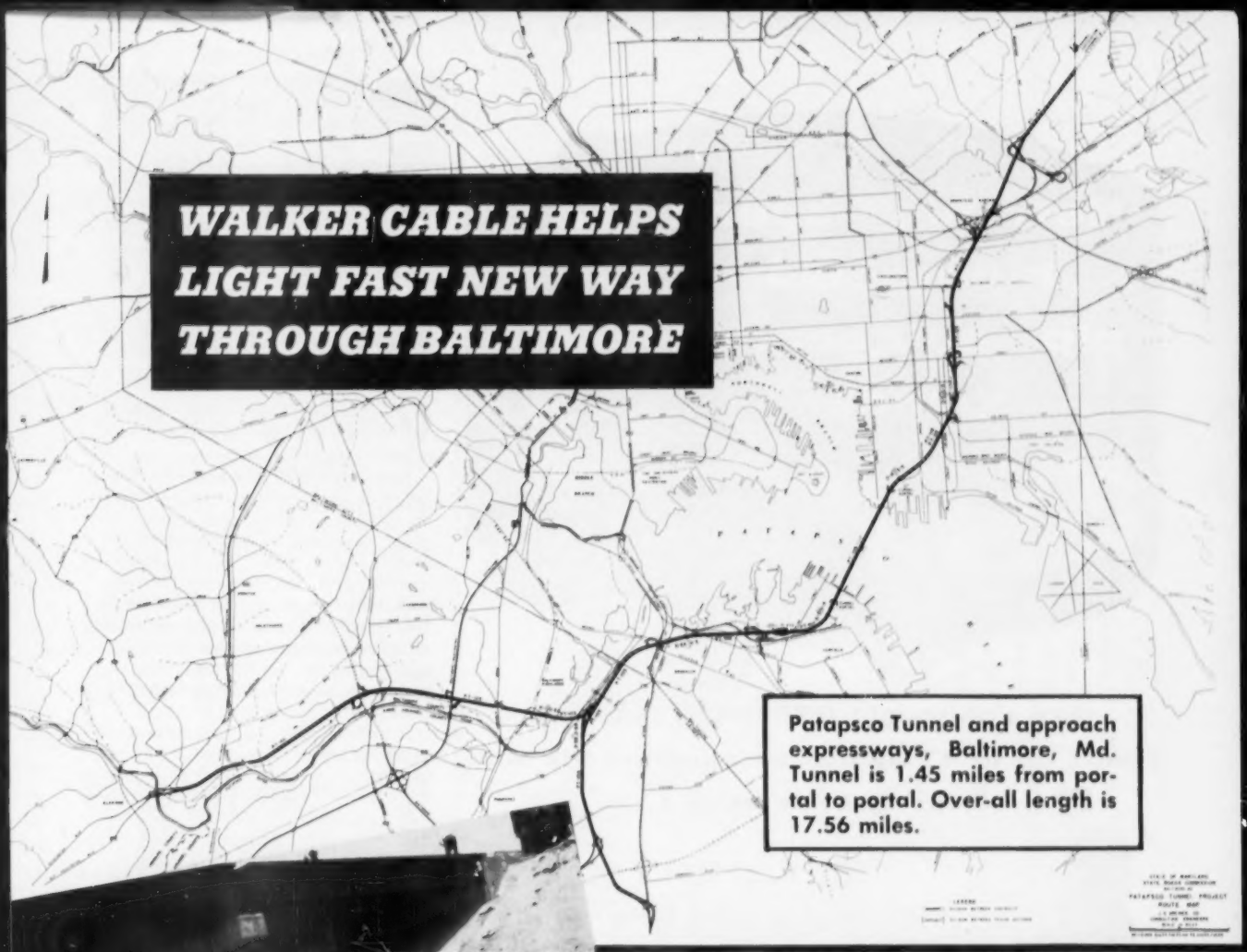
DON'T MISS ANY LAST MINUTE JOBS!

UNION ships Sockets and Streamers SAME DAY!

THROUGH QUALIFIED WHOLESALERS EVERYWHERE

UNION INSULATING CO.
PARKERSBURG, WEST VIRGINIA

WALKER CABLE HELPS LIGHT FAST NEW WAY THROUGH BALTIMORE



Patapsco Tunnel and approach expressways, Baltimore, Md. Tunnel is 1.45 miles from portal to portal. Over-all length is 17.56 miles.

J. E. Greiner Co.	*Consulting Engineers*
Green Associates	*Lighting Engineers*
American Electric Co.	*Electrical Contractor*
H. A. Harris Co.	*Electrical Contractor*
Lovette Electric Co.	*Electrical Contractor*

Included in the more than a million feet of Walker cable manufactured for the approach expressways to the Patapsco Tunnel, Baltimore, Md., is over a half million feet of Walker 5 KV cable. Walker wire and cable has earned, over the past quarter of a century, a reputation for quality insulation and careful manufacture. On your next job—whether you recommend, specify, or buy wire and cable—think of Walker first . . . to last!

walker of Conshohocken

WALKER BROTHERS

Conshohocken, Pa.

Power Cable • Control Cable • Street Lighting Cable • Service Entrance Non-metallic Sheathed Cable • Rubber Covered • Lead Covered Thermoplastic Insulated • Neoprene Weatherproof and other types

New lightweight GREENLEE No. 884 bends up to 4" conduit as much as 90° with one fast ram stroke

One man wheels it from job to job . . . on its specially designed pipe support!

Universal pipe supports, positive locking pin . . . many other advanced features.

Speed conduit installations, cut costs with this time-saving GREENLEE tool. New, advanced design to meet your needs for a lighter weight, faster, easier portable, easier operated hydraulic bender for conduit of ½" through 4" sizes.

Full 90-degree bend is made with one ram stroke of this advanced new tool in just 4 minutes with GREENLEE Power Pump shown above! Combined with the faster No. 797-E-SA Power Pump for production work, new bender actually bends 4-inch conduit 90° in only 30 seconds! Precise smaller bends of any degree are facilitated by scale on side of ram.

High-strength aluminum alloy is combined with high-alloy steel for ideal structural combination of ruggedness and light weight. Bender develops 40 tons of ram pressure; yet one man easily transports, sets up, and operates it.

A dozen advanced features put the 884 in a class by itself for easier portability, versatility, simple setup, easy operation, and ideal job or production speeds of bending. For instance, universal pipe supports, simply rotated to handle 10 conduit sizes, also facilitate easy insertion and removal of conduit from *front* of bender.

Meets wide range of bending needs: bends ½-in., ¾-in., 1-in., 1¼-in., 1½-in., 2-in., 2½-in., 3-in., 3½-in., and 4-in. pipe and rigid conduit.

Ask the GREENLEE Canadian representative or write for new illustrated Bulletin, E-224, giving full details and specifications.

TOOLS FOR CRAFTSMEN
GREENLEE

GREENLEE TOOL CO., 1752 Columbia Ave., Rockford, Illinois

tems and, in the fine print note, it further states that when they are 300 ft or more in length or if they are of the ungrounded type. In your case it is assumed that the secondary consists of 3-phase 4-wire with an interconnection of grounds between the secondary and primary as well as all equipment grounds.—G.R.

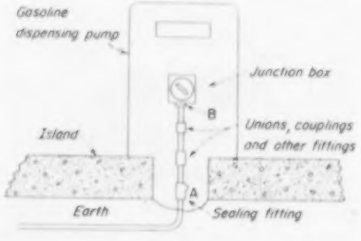
Gasoline Dispensing Stations—Sealing

Q. *Section 5120, paragraph f, part 1 of the National Electrical Code is as follows:*

"An approved seal shall be provided in each conduit run entering or leaving a dispensing pump or other enclosure on a dispensing island. There shall be no union, coupling, box or fitting in the conduit between the sealing fitting and the point at which the conduit emerges into the pump or other equipment, or into any cavities or enclosures in direct communication therewith."

I understand the last sentence above to mean that there shall be no union, coupling, box or fitting in the conduit between the sealing fitting and the point at which the conduit emerges "from the ground" into the pump, etc. The sealing fitting, therefore, should be at point "A" in the diagram below. There is considerable difference of opinion in my office about this, however. Some maintain that the sealing fitting should be at point "B", claiming that this is the point at which the conduit emerges from the pump. Please clarify this for us.

In a gasoline dispensing and service station, a conduit run underground from the distribution panel located in the office to supply a lighting standard or sign on the corner of the lot passes directly under a dispensing island. Where this conduit goes underground is a Class 1 Div. 2 location. Where it emerges at the light or sign is completely out of any hazardous area. According to Section 5120, paragraph b, part 2, this entire run of conduit is to be considered a Class



ADVERTISEMENT

HOW LEVITON BRINGS YOU BETTER PRODUCTS, SAVES YOU MONEY

There are many good reasons why you are assured finer quality electrical wiring devices when you specify Leviton.

World's most complete line—One of the largest manufacturers of electrical wiring devices, Leviton maintains four plants, staffed by over 5,000 specialists, manufacturing 10,000 different items. Gives you one source for all your wiring needs, including all specification grades.

Complete quality control—from raw material to finished product. Each component part is precision manufactured and rigidly inspected during every stage of manufacture. Insures uniformly superior quality, *better products.*

Leviton's large, ultra-modern Testing Laboratory—helps you keep pace with future developments. Also, existing products are constantly tested and improved. Leviton continues to develop new processes which maintain superior quality while keeping prices at the lowest possible level.

Leviton—a name backed by nearly half a *century of experience*—can always be specified with confidence. Test Leviton wiring devices against comparable products of any other manufacturer. Discover Leviton's superiority for yourself. Product samples are available on request. Write today—Leviton Manufacturing Company, Brooklyn 22, N. Y.

one brand stands out...

LEVITON *specification grade* Switches and Receptacles

for industrial, commercial and residential use

Compare Leviton even under the most extreme conditions. Leviton wiring devices give you the utmost in performance at minimum cost . . . with absolutely no compromise in quality.

COMPARE THESE SPECIFICATION GRADE SERIES

- "5000" Line
- Lev-o-lock
- Quickwire
- U-grounding Devices
- Interchangeable Devices
- Lev-o-Let
- Weatherproof Devices

CHECK THESE FEATURES FOR YOURSELF

- Molded of heavily sectioned rugged bakelite.
- Heavy gauge, rust-proofed underslung strap solidly riveted to cover and base.
- Wide break-off plaster ears.
- Large head No. 8 terminal screws staked and backed out to accommodate No. 10 conductors.
- Individually packed with mounting screws attached to strap.
- Switch mechanisms utilize a high grade bronze for wide, double wiping contacts.
- Solidly riveted assembly prevents any loosening.
- Receptacles have double-wiping phosphor bronze contacts.
- Meet UL, C.S.A. and Federal Specifications.

LEVITON

Samples on Request

LEVITON MANUFACTURING COMPANY
BROOKLYN 22, N. Y.

Chicago • Los Angeles • Leviton (Canada) Limited, Montreal
For building wire and cable contact our subsidiary: AMERICAN INSULATED WIRE CORP.

Have You Noticed the Difference?

the NEW IDEAL Wire-Nut® CONNECTORS

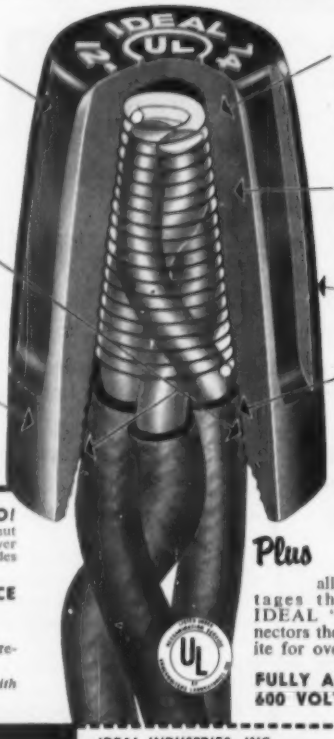
now improved 7 ways!

MORE THAN EVER—YOUR BEST BET IN WIRE CONNECTORS

NEW KNURLING
Easier to tighten and handle—more shell thickness around wires than any other connector.

NEW WIDER THROAT
Makes it easier to join *larger* wire combinations—no fumbling when inserting wires into *this* connector.

NEW LONGER SKIRT
No chance for flash-over or exposure of bare wire.



NEW CLOSER TOLERANCES
In both spring insert and shell give you a still stronger, "firmer" joint.

NEW PHENOLIC COMPOUNDS
Make shell stronger than ever and more uniform.

NEW CURING
Better weathering, aging and porosity characteristics.

NEW BUTTRESS THREADS
Increase strength of shell, make it easier to "slide" wires into insert and help eliminate chance of flash-over.

THEY NEVER LET GO!
Just screw them on like a nut on a bolt. Screw-and-Lever and Wedge Action provides up to

2½* TONS OF FORCE . . . A WIRE CRUSHING GRIP
that actually flattens and reforms wire.

* *"Wire-Nut" Size 74B with 2 No. 14 Wires.*

Plus all the other advantages that have made IDEAL "Wire-Nut" Connectors the industry's favorite for over 30 years.

FULLY APPROVED 600 VOLTS

SOLD THROUGH AMERICA'S LEADING DISTRIBUTORS

IDEAL

IDEAL INDUSTRIES, INC.
1041-L Park Avenue, Sycamore, Illinois (IDEAL)
Please send catalog on Ideal "Wire-Nuts" Connectors.

Name_____

Company_____

Address_____

City_____ Zone____ State_____

Canadian Distributor: IRVING SMITH, LTD., Montreal

1, *Div.* 1 *because it passes under one of the dispensing islands.*

The question is—are sealing fittings required in this run of conduit and where are they to be located?—M.H.N.

A. During the past two years this question has been the source of considerable discussion, and the new 1956 revision of Section 5120-f was intended to clarify such questions. As shown by your diagram the sealing fitting must be located at the point marked "A". This is the point where the conduit emerges into the cavity under the pump housing. To place a seal fitting at the point "B" would not safeguard the hazard involved, since gasoline vapors could enter the conduit system at the unions or couplings. When the seal fitting is installed at point "A" the chances for gasoline fumes entering the conduit is minimized since there are no fittings between the seal and the point where the conduit emerges from the ground.

In answer to your second question, the new 1956 revision of Section 5120-b-2, intends to clarify the question raised. According to the 1953 code a run of underground conduit, passing through the 20-ft hazardous area adjacent to the dispensing island, would require a seal where the conduit left the hazardous area. See Section 5120-f-2, and Section 5015-a and b. This provision would require an underground seal, which was impractical, since it destroyed the effective use of a raceway designed for the ready removal and replacement of conductors. In order to clarify the intent of the code in this respect, the last sentence of Section 5120-b-2 was revised, so that the hazardous area was extended to the point of emergence of the conduit. As a result, it is no longer required that a seal fitting be installed underground, but one is required where the conduit emerges from the ground in a non-hazardous area.—B.A.McD.

Flexible Conduit—Motor Terminals

Q. *Section 2557 of the code states that metal boxes, cabinets and fittings of non-current-carrying parts of other fixed equipment, if metallically connected to grounded cable armor or metal "raceway" are considered to be grounded by such connection. Ar-*

ticle 100 defines "raceway" as including flexible metal conduit.

Section 2591-b definitely does not include flexible metal conduit as one of the materials approved for use as an equipment grounding conductor.

My questions are:

(a) Does not Section 2591-b eliminate the use of flexible metal conduit as part of the grounding conductor for equipment, particularly motor frames? (I am thinking of your answer in the June issue to the question of requiring bonding jumpers around flexible metal conduit motor connections.)

(b) Are not the two above quoted sections in conflict?

A clarification of these questions would be greatly appreciated. My work includes inspection of a large number of motor installations, and I need a more definite interpretation than given in your June issue to convince contractors that a jumper is required.—D.J.N.

A. The provisions of Section 2557 comes under the general heading of "Methods of Grounding", while the provisions of Section 2591-b concern the materials suitable for use as "Grounding Conductors". As a result, there is a fine distinction between the two code provisions which is difficult to visualize. The provisions of Section 2557 definitely recognize the grounding of outlet boxes, cabinets, motor frames, controller frames, etc., through the flexible conduit when it is used, in part of whole, as the circuit wiring method. As a result it becomes a grounding conductor for the various types of equipment it serves.

The provisions of Section 2591-b cover the materials recognized as grounding conductors for the grounding of conductor enclosures and equipment only. As you say, flexible metal conduit is not included under this heading and a question immediately arises concerning its recognition for the same purpose under Section 2557. While there appears to be a conflict between these code rules, I do not believe there is any intent to abrogate the provisions of Section 2557.

In view of the foregoing, and as covered in the June issue of EC&M, flexible metal conduit may be used to serve a motor as recognized by Section 4439-a. While a jumper across the flexible conduit is desired for several reasons, there is no code provision requiring such a jumper.

It is interesting to note the provisions of Section 2382-c which in-

Takes the "UGH" out of TOUGH wire pulling jobs

IDEAL WIRE LUBE

- Makes Wire Pulling Easier, Gets the Job Done Faster
- Protects Insulation Against Breaks and Strains
- Use it on Rubber, Lead or Plastic Covered Wire or Cable
- Available in pint, quart, 1-gallon, 5-gallon and 55-gallon Containers, Also in Handy Tubes

"Wire Lube" is a special formula lubricant that makes the toughest, muscle-straining wire pulling jobs quick, simple, easy. The liquid lubricant can be hand or brush applied to wire or cable as it is pulled into the conduit. Wires and cable "rides" in on a film of lubricant which quickly dries to a fine white powder. No sticky sludge forms to bond wire and conduit; in fact, the powder makes the removal of wires much easier. Wire Lube is non-corrosive, non-combustible and can't injure hands or clothing. Order today for easier wire pulling jobs tomorrow.

Also Available in New Tube Packages

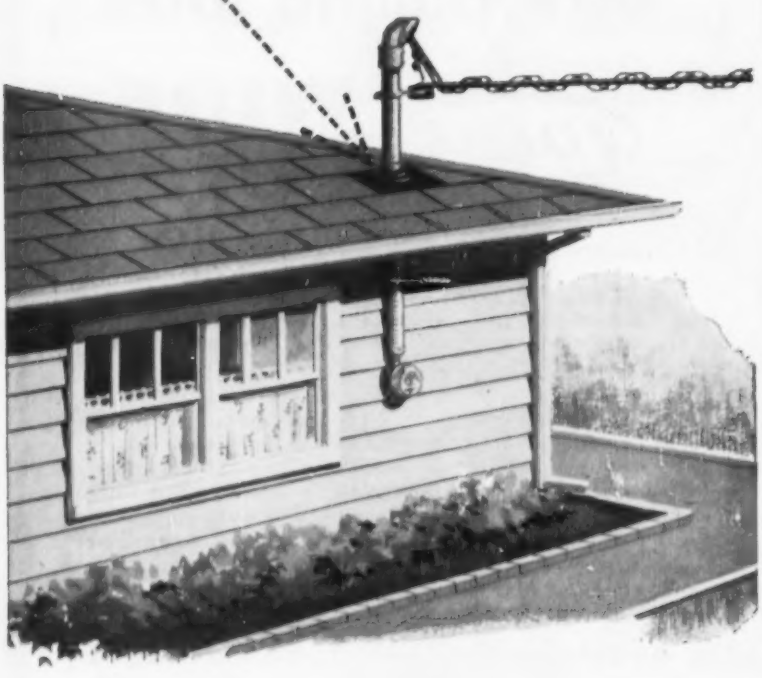
Handy, individually packed tubes of Wire Lube are ideal additions to the electricians tool box. Each tube contains just enough Wire Lube for the average small job. Look for the attractive display carton on your Distributor's sales counter.

Mail Coupon For Catalog Details

IDEAL INDUSTRIES, INC.
1041-L Park Avenue, Sycamore, Illinois
Please send catalog on Ideal "Wire Lube"
Name
Company
Address
City Zone State
Canadian Distributor: IRVING SMITH, LTD., Montreal

SOLD THROUGH IDEAL LEADING DISTRIBUTORS

SYNROFLASHING
protects this roof from moisture leakage... mast vibration damage



All Blackhawk service entrance mast kits feature this new synroflashing unit. It's a neoprene roof flashing unit that absorbs mast vibrations in the collar area. The mast can't work loose, damage shingles or give moisture a place to seep in.

Synroflashing is weather proof and weather resistant. Won't crack, peel or rot no matter what the atmospheric conditions. Synroflashing units on the Blackhawk Service Entrance Mast will give long years of dependable, trouble-free performance. Units are easily installed. They simply slip over the pipe and are pushed down to the roof. Shingles fit over it easily. Synroflashing units are available for 2" and 2½" pipe.

Blackhawk service entrance masts, with Blackhawk's famous Slip-Fitter head and new Synroflashing, can be sold as complete kits or as separate fittings.

Blackhawk Industries, Dubuque, Iowa
Where the new ideas come from

dicate that flexible metal conduit may be used in a service run, and if so it must be bonded. Such bonding is not required when flexible conduit serves a motor.—B.A.McD.

NEC Amendments

Two tentative interim amendments to the 1956 edition of the National Electrical Code, with effective dates as noted, have just been released by the National Electrical Code Committee of the National Fire Protection Association.

Tentative Interim Amendment No. 104

(Effective August 12, 1957)

Text of this amendment, which deals with overcurrent protection for motors, is as follows:

ARTICLE 430—Motors and Motor Controllers

Paragraph a-1 of Section 4322, to be amended as follows:

"A separate overcurrent device which is responsive to motor current. This device shall be rated or set at not more than 125 per cent of the motor full-load current rating for sealed (hermetic-type) refrigeration compressor motors having a locked rotor value not exceeding 160 amperes and motors marked to have a temperature rise not over 40 C, and at not more than 115 per cent for all other types of motors. This value may be modified as permitted by Section 4324."

Paragraph c-1 of Section 4322, to be amended as follows:

"A separate overcurrent device which is responsive to motor current. This device shall be rated or set at not more than 125 per cent of the motor full-load current rating for sealed (hermetic-type) refrigeration compressor motors having a locked rotor value not exceeding 160 amperes and motors marked to have a temperature rise not over 40 C, and at not more than 115 per cent for all other types of motors. This value may be modified as permitted by Section 4324."

Section 4324—*Selection or Setting of Protective Device:*

"Where the values specified for motor-running overcurrent protection do not correspond to the standard sizes or ratings of fuses, nonadjustable circuit-breakers, thermal cut-outs, thermal relays, the heating elements of thermal trip motor switches, or possible settings of adjustable circuit-breakers adequate to carry the load, the next higher size, rating, or setting may be used,

Most customers buy several

EXIDE LIGHTGUARD® EMERGENCY LIGHTING UNITS

Average sale over $150—nationwide figures show

Stores, factories, theaters, schools, restaurants, offices—they all need Exide Lightguard protection. You make a good profit on every sale. It's business well worth going out after. The market is tremendous—scarcely tapped. Get in on the ground floor. Become a dealer for Exide Lightguard units—foremost in the field. Send coupon today.

When power fails and lights go out, Exide Lightguard Emergency Lighting Units go on—instantly and automatically. Plug into regular outlets. Automatic built-in charger. Batteries last for years.

Exide® Industrial Division
Electric Storage Battery Company, Phila. 2, Pa.
Send details on Exide Lightguards—and how I can become a dealer.

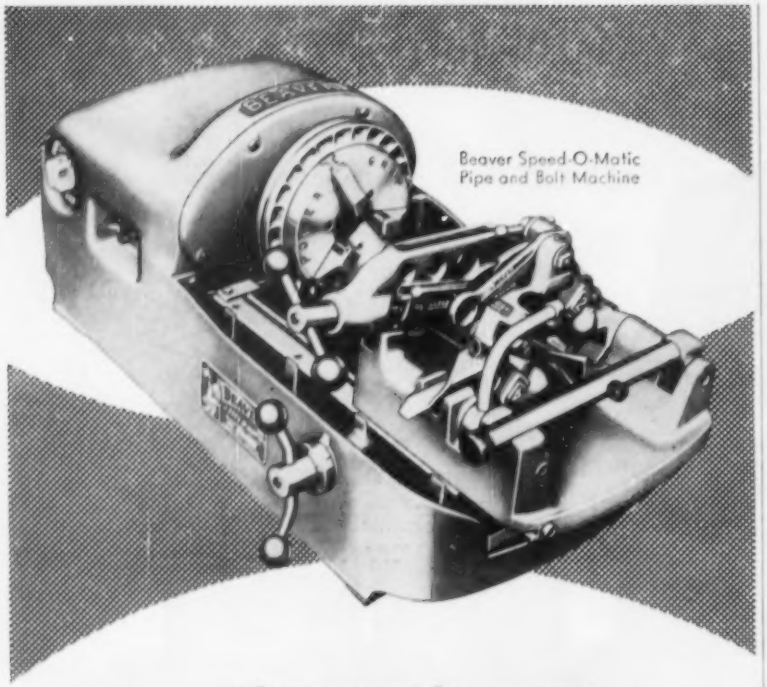
Name_____

Street_____

City_____ Zone____ State_____

My business is_____

16



when you buy new... pipe and bolt machines... make sure they are *Really New!*

Today, when quality-plus-quantity production is so important, you can't afford to use obsolete methods and equipment. You need equipment designed to produce more work per hour at less cost, with more profit to you. The new Beaver Speed-O-Matic is the latest development in pipe and bolt machines. It's faster—more powerful. It's rugged, yet weighs only 170 pounds. It's lubricated for life. And, it's an ideal make-up machine. Let us prove to you that you can't afford to be without the **NEW** Beaver Speed-O-Matic! Send for the complete story today!

BEAVER PIPE TOOLS INC. 279-300 Bata Ave. WARREN, OHIO

Can't Tell It All Here! Write for latest facts on all Beaver Machines!

Have a Cutting or Threading Problem? Let Our Engineering Research Department help you solve it.

but not higher than 140 per cent of the full-load current rating of sealed (hermetic-type) refrigeration compressor motors having a locked rotor value not exceeding 160 amperes and motors marked to have a temperature rise not over 40 C, and not higher than 130 per cent of the full-load current rating for all other motors. If not shunted during the starting period of the motor (see Section 4325), the protective device shall have sufficient time delay to permit the motor to start and accelerate its load."

Tentative Interim Amendment No. 106

(Effective September 25, 1957)

This interim amendment deals with motor controllers as running overcurrent protection. Text of the amendment follows:

"Section 4328—Delete the fine print note at the end of the Section."

"Section 4329—Motor Controller as Running Protection. A motor controller may also serve as the running overcurrent device if the number of overcurrent units complies with the foregoing Section 4327, and if these overcurrent units are operative in both the starting and running position in the case of a dc motor, and in the running position in the case of an ac motor. When a non-automatic motor controller serves as the running overcurrent device, it is recommended that all ungrounded conductors be opened."

The release of these amendments to the 1956 edition of the National Electrical Code is in accordance with NFPA policy of keeping its standards up to date to furnish guidance in proper installation of equipment and safeguarding of hazards in furtherance of the general objective of the Association to reduce loss of life and property by fire. Like other NFPA standards, these amendments are the result of action by a representative national committee organized in the general public interest through participation of various important groups concerned.

These amendments, developed under the published Procedure for Tentative Interim Amendments, are recommended by the Committee for application in the administration of the 1956 NEC. They are subject to further consideration by the National Electrical Code Committee and official action by National Fire Protection Association in connection with the next general revision of the NE Code.

Put all the facts about lighting glassware at your fingertips

These product bulletins from Corning make your files complete—*What* kind of lighting glassware to use . . . *where* . . . and *why*—are spelled out for you.

You'll have these facts at your fingertips when you get these product information bulletins from Corning. Data sheets give you physical characteristics, calculations, photometric tables and charts.

The "Commercial Lighting Application Guide" summarizes types of glassware available, illustrates where and why each type is most efficient.

Be set to discuss and specify engineered lighting glassware for *every kind of job*. Send for the items you need, today.

CORNING GLASS WORKS 65-12 Crystal Street, Corning, N.Y.

Please send me the following material: "Commercial Lighting Application Guide" ☐; "Engineered Lighting Glassware" ☐; "Pattern No. 70 Low Brightness Lens Panel" ☐; "Low Brightness Curved Lens Panel" ☐; "Pattern No. 83 Crysta-Lite for 12" and 24" toffers" ☐; "Alba-Lite in Flat Panels" ☐; "Toffer Curved Alba-Lite Panels" ☐; "Twinlite Lens Panels" ☐; "Foto-Lite" ☐; "Square Concave Lenslites" ☐; "Corning Tempered Lenslites" ☐.

Name.....
Title.....
Company.....
Street.....
City.....
Zone..... State.....

Corning means research in Glass **CORNING GLASS WORKS** 65-12 Crystal Street, Corning, N.Y.

Compare—

the Appearance of National Electric Xduct Junior, E.M.T.

You'll see the difference immediately! A bright, attractive silver finish that makes Xduct ideal for exposed-to-view installations. This outstanding finish results from the addition of a special brightening agent that gives each length of Xduct not only its brilliant luster, but years of corrosion resistance. New on the outside . . . new on the inside—specify National Electric Xduct.

it's **NEW** on the inside...
NEW on the outside

Outstanding holding action, vibration resistance NE Couplings

National Electric E.M.T. Fittings are safe and strong because of the sturdy one-piece pressed steel body and outstanding holding action of the patented NE embedding screw.

A screwdriver is all that is needed to install National Electric E.M.T. fittings. Try them . . . they are sold by leading electrical distributors everywhere.

NATIONAL ELECTRIC PRODUCTS
NE
WIRING SYSTEMS
WIRES AND CABLES

National Electric Products

PITTSBURGH, PA.
2 Plants • 12 Warehouses • 41 Sales Offices

In The News

NECA Convention Cites Industry Coordination as No. 1 Objective

Better teamwork between the many segments of the electrical and construction industries, support of H. R. 7168, and a statement of interdependence principles called for at Cincinnati meeting. Burnett re-elected president.

CINCINNATI, Ohio, was the scene of the 56th Anniversary Convention of the National Electrical Contractors Association, from November 11 to 16. Over 2,900 registrants—electrical contractors and guests—took part in a program of business and educational sessions and entertainment events. An electrical exposition was held in conjunction with the convention. More than 180 firms were represented in the exhibits of materials, equipment, tools and services for the electrical contracting industry.

The theme of the convention was "Industry Coordination". Much of the program dealt with methods for effecting better coordination of the many segments of the electrical and construction industries. And teamwork was constantly spotlighted as the key to efficient and effective industry operations.

Coggeshall Award

At the opening general membership session, George Andrae of the Herman Andrae Electric Company, Milwaukee, was presented with the first Coggeshall Award. This award is made annually in honor of the late Allan Coggeshall of Hatzel and Buehler, Inc., New York City. Mr. Coggeshall, who was a prominent member of the NECA Codes and Standards Committee, bequeathed $2500 to NECA in his will. The Coggeshall Award has been established to honor the NECA member adjudged to have made the greatest contribution to the electrical contracting industry during the preceding year, in the field of activities of NECA Technical and Training Service. The Award consists of a medal and a purse of $100. The Award was made to Mr. Andrae by Oliver F. Burnett, president of NECA, and read as follows:

"George Andrae of Milwaukee, Wisconsin, whose firm has the distinction of being perhaps the oldest electrical contracting organization in the world, has given most generously of his more than a half century in the industry and of his talents to promoting safe and efficient electrical installations. His service to his industry in developing safety codes and standardization methods covers nearly 30 years.

"He, with Allan Coggeshall, served as representative of the electrical contracting branch in the Old Electrical Committee which developed the National Electrical Code. With Mr. Coggeshall he took the lead more than a decade ago in bringing about a change in code-making procedures that gave each element in the Electrical Industry more equitable and fairer regulations. He merits large credit for the present system of Code Making Panels and the Correlating Committee which are now acclaimed as fair to all yet flexible enough to accommodate new methods, new materials and new construction techniques.

"It is therefore with a sense of deep gratitude that the National Electrical Contractors Association awards to George Andrae the first Coggeshall Award, consisting of this medal and purse, made possible by the terms of the will of the late Allan Coggeshall."

At the same session, Honorary Membership was conferred upon: A. G. Ofenstein of Detroit, who has been active in the industry for over 59 years and who pioneered embedding of conduit in concrete and development of labor units.

Lester F. Brooker of New York, who was chairman of the first NECA Business Development committee, laying the groundwork for the NECA public relations program, the NECA Marketing committee and the NECA Governmental Affairs committee.

Arthur C. McWilliams of Chicago, who contributed much to the engineering and estimating technology of the industry.

The Association

Opening the formal business session, Clint J. Harder, Secretary-Treasurer of NECA, made a report on association financial conditions and membership. On September 30, the association had 3,834 members and 114 Chapters. Paul Geary, NECA Executive Vice President, gave a general account of association progress and a report on the meeting of the Board of Governors.

Progress Reports

The nine standing committees of NECA reported various information and recommendations at the Board of Governors meeting:

Governmental Affairs—The legislative program advanced rapidly. The Federal Construction Contract Procedures Act (H. R. 7168) has only to be voted on by the Senate to become law. This legislation will curb bid shopping and bid peddling on federal construction. This bill

brands bid shopping as an "unfair trade practice". This will also have effect in checking the practice of bid shopping on private construction work.

Research — The committee reported completion of the "Commercial, Institutional and Industrial Electrical Modernization Training Course" and the "Residential Electrical Modernization Sales Training Course" for management personnel. And rights have been obtained to a "Simplified Mechanical Bookkeeping System" adapted to an average electrical contractor's operations.

Codes and Standards—As part of a general program to upgrade minimum requirements in the next NE code change, the committee urged action on code sections restricting conduit occupancy by conductors. This is to be based on the recent report of the Industry Committee sponsored by the American Iron and Steel Institute covering unlimited conduit fill with derating of conductor carrying capacity to limit temperature rise.

Detailed recommendations were made to improve code coverage of the installation of unit air conditioners. Standardization of plugs on cords for voltage and size was urged to make possible installation of proper receptacles in advance. And to clarify minimum design conditions—circuiting, protection, connection, etc.—it was recommended that the code be revised to require a separate individual branch circuit for unit air conditioners. A fuller clarification of air conditioners under Article 210 and Article 422 (Secs. 4291 to 4293) and a correlating of these articles with Article 430 is needed to assure safe application. Grounding type plugs with an equipment ground in the power cord should also be mandatory. Official objection was made to the type of advertising that tells the public that "This unit can be plugged in anywhere".

The committee also recommended: more specific detail on low-voltage wiring for remote control of lighting in residences be considered; that a grounding conductor be required in all non-metallic sheathed cable used with metallic boxes in residential wiring; that study be made of service and equipment grounding in areas where plastic or other types of non-conducting home water service pipes are being used and prevent grounding to the water pipe; and that the general minimum size of service be firmly set at 100 amps.

Line Construction—Progress was reported in the program to organize line contractors into eight regional chapters. Six chapters have been established with 111 line constructors enrolled.

Labor—The national professional staff supervising the joint apprenticeship and training program was doubled during the past year to accelerate activity to meet the need for skilled workers. The Council on Industrial Relations provided voluntary arbitration in 48 cases which represented potential strike threats during the past year.

The Speakers

"What is the most important problem in our business?", asked Oliver F. Burnett, NECA president, as he opened his talk on *The Need for Industry Coordination.* And he answered, ". . . I find in looking back that the major problem I always had was sales". He pinpointed sales-at-a-profit as the most important single problem in every business, and stated that electrical contractors are falling down on the selling job to the point that "Other people are getting into the business and performing the function of electrical contractors". He pointed to industry coordination—cooperation with utilities, wholesalers, general contractors on an enlightened basis—as the way to eliminate problems that beset the electrical contracting industry and push contractors to compete for jobs at little or no profit.

Electricity and the Contractor was the subject of an address by Edwin Vennard, managing director and vice president of the Edison Electric Institute. In a report on the record growth of electric energy consumption, he noted that the power generating industry had a 1956 capacity of 126.5 million kilowatts and will require a capacity somewhere between 191 million kilowatts and 233 million kilowatts by 1966—and possibly up to 452 million kilowatts by 1976. Mr. Vennard cited the deplorable condition of home wiring throughout the country today and discussed the Housepower program for residential electrical modernization. He pointed out that success of the program depends upon the electrical contractors. In the field of industrial electrical modernization, he noted that the Industrial Electrification Council has formed the Industrial Electric Power Distribution Division Steering Committee to develop an educational and promotional program for 1958.

In a talk on *Coordinating the Electrical Industry,* Arthur E. Bertke, chairman of the NECA Marketing Committee, discussed the role of the electrical contractor as a salesman and as a member of the industry "team". In cooperation with other members of the electrical team, particularly with manufacturers, the Marketing Committee studied better coordination in the engineering, handling and adaptation of materials and equipment. The committee put some results of the study in the form of recommended practices which Mr. Bertke set forth as a *Statement of Interdependence Principles.*

Melvin H. Wessel, chairman of the NEMA Electric Heating Section and sales manager of the Electric Heating Division of Cavalier Corp., Chattanooga, Tenn., called for coordinated industry action in the field of electric heating. Success of electric heating, he pointed out, requires constant coordination among electrical contractors, utilities and distributors.

Gerald G. Diehl, president of the Detroit Chapter of the American Institute of Architects, set forth the place of the architect in the industry team and pledged full cooperation of architects in the effort for better industry coordination. On bidding and contractural relations, he emphasized that each industry group must stay in its own field.

Symbolic of the spirit of industry coordination which was the convention theme, James D. Marshall, executive director of the Associated General Contractors of America, addressed the convention to discuss better relations between general and electrical contractors. He focused attention on the problems of bid shopping and bid peddling—which he cited as a big stumbling block to complete coordination in the construction industry. Education is the answer to this problem, he said. It will build up mutual confidence and tend to make the job a joint venture operation rather than a divided operation between prime contractor and subcontractor. Mr. Marshall noted a deterioration in bidding practice as the result of greatly increased governmental work over the past 20 years. The relationship was different than that which electrical contractors had with their favorite industrial plants or in the commercial field where more than price was considered on the jobs. But through recent years the two associations have worked together to eliminate the objectionable practice.

Soggy land and heavy reels of Okonite Cable presented a rugged installation problem. But by digging a 4-foot trench, and by "putting the Cat before the truck before the float," Guarantee Electrical Co. laid down two cables simultaneously at three miles per hour. Cables were a 15kv, 3-conductor Okolite-Okoprene submarine power cable and a 24-conductor Okolite-Okoprene submarine control cable designed to assure the continuous water supply essential to plant operation.

"We specified Okonite because...

This tough installation called for top-quality cables to assure continuous plant operation"

"Demanding assignments are 'our meat'," says Arthur Kaspar, Chief Electrical Engineer of Guarantee Electrical Company of St. Louis. "A good example is our recent cable installation for a large plant here in Missouri.

"Our client specified a never-failing, 24-hour-a-day, controlled source of plant water. The best pumping station site was miles from the plant, in low-water marsh land subject to periodic flooding from the Mississippi River—up to 25 feet above river level. One thing was certain . . . this called for really dependable cables for power and for control of the complex pumping station that would supply the water to the plant.

"Another thing was certain, too . . . this was a job for Okonite. Our experience has taught us that Okonite gives maximum insurance and value where dependability in vital circuits is concerned."

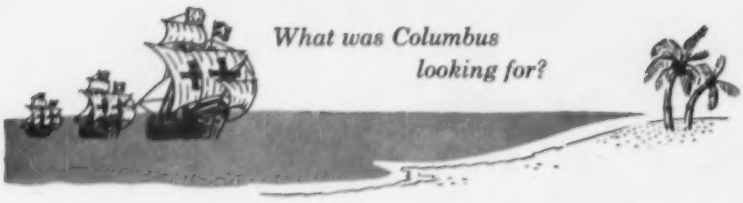
Conferences between Mr. Kaspar and Okonite developed the proper cables: unaffected by water, highly resistant to soil conditions and other factors that attack *any* buried or submerged cable, and backed up by Okonite's 78 years of making highest-quality cable.

* * *

For your vital circuits, take a tip from Mr. Kaspar and other leading electrical engineers and specify Okonite. Whatever the installation, when you talk to Okonite you'll get an unprejudiced recommendation for your cable needs because Okonite, *and only Okonite*, makes cable by all four insulating methods: strip, dip, extrusion and taping. The Okonite Company, Passaic, New Jersey.

5248

***where there's electrical power... there's* OKONITE CABLE**



You'll find what you're looking for . . . with

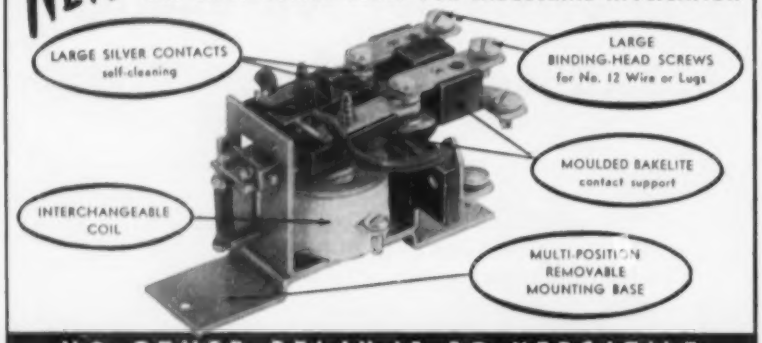
Columbus
BRAND
CONDUIT FITTINGS

For years the name "Conduit of Columbus" has been the standard of leadership in conduit fittings. To positively identify this quality, specify the brand name "Columbus" conduit fittings. Ask for them by name.

CONDUIT PIPE PRODUCTS CO., COLUMBUS, OHIO

SOLD ONLY THROUGH RECOGNIZED WHOLESALERS

NEW **GENERAL PURPOSE RELAY**
(SERIES 130 RELAY)
THE MOST USEFUL RELAY FOR INDUSTRIAL APPLICATION



NO OTHER RELAY IS SO VERSATILE

SPECIFICATIONS

CONTACTS	RATINGS	COILS	MOUNTING BASE
Single-and-double pole	20 amp. at 115 V	AC & DC to 230 V	Metal strap or bakelite.
Single-and-double throw	60 Cy. AC or 24 V DC	(Interchangeable)	Base can be rotated 90 degrees either direction
Aux. DT contacts available	U.L. Approved	Power—2 watts	for mounting convenience.

DIMENSIONS Base—1" x 3⅛"

Request complete data on Series 130 Relay.

Wheelock SIGNALS INC
RELAYS W S LONG BRANCH, N. J.

Stanley Cameron, vice president of the Howard P. Foley Co., spoke for electrical contractors on the subject of industry coordination. He referred to the controversy over separate contracts and defined his term: the award by the owner or the awarding authority of a separate contract for the electrical, another one for the heating, another one for the plumbing and one for other work. The specialty contractor would bid the work, get a direct prime contract award and accomplish the work without contractural obligation to anyone but the owner. He specifically did not use the term to describe practices or statutes which have separate bidding but in the end include all work under a single contract.

Mr. Cameron felt that separate contracts were effective in ending bid shopping and bid peddling, but that such a setup destroyed coordination by the general contractor on the job. On public works projects, a public agency had to provide coordination where separate contracts were awarded, adding excessive cost to the job and causing the specialty contractor all types of difficulties.

Management Training

The vital need for better management training and modern business techniques in the conduct of an "average" electrical contracting operation was effectively presented in a dramatic skit at the third general membership session. Deftly woven into the script were the various NECA technical and training services as well as education and equipment aids from independent sources. Of particular interest to electrical contractor estimating and engineering personnel was the disclosure that the Building Research Institute (Washington, D. C.) and the Construction Specifications Institute (Boston, Mass.) are working toward uniformity and clarity of specifications, terminology, trade standards, trade jurisdiction, and the practice of tailoring specifications to the specific job.

Manpower Problems

A panel discussion on labor relations and manpower during the final convention session revealed that the pool of skilled manpower is not being replenished at a sufficient pace to offset retirements, deaths and expansion in the electrical construction industry. The number of mechanics in training should be

based on the number of journeymen needed over a four to five year period, according to Bill Damon, director, NECA Joint Apprenticeship and Traning Program. This year, some 18,679 apprentices are in training in 508 wage areas and 2,706 Completion Certificates (a 198% increase over 1954) will be issued.

A new and more enlightened approach to management-manpower problems is necessary, A. R. Wooley, manager, Intermountain Chapter, NECA, Salt Lake City, Utah, told the convention. Taking the "detached viewpoint of an ex-contractor", Mr. Wooley cautioned against the restrictive clauses in labor agreements and the forcing of work into "protected" channels for the "fenced-in protection" benefiting the few. With the aid of prepared charts, he noted the increasing amount of electrical work going to "non-union" contractors and electricians, adding that very little permanent increase in Union manpower was evident in the last six years despite about a 65% increase in the number of electricians employed. The unorganized (non-union) segment of our industry has reached a position where it is becoming a real challenge.

We must be realistic and negotiate agreements which recognize the problems of the non-union contractors and their men; in effect, take this management and manpower force into the skilled labor pool. Mr. Wooley suggested management and labor disregard efforts to restrictiveness; strengthen the management and manpower pool; give serious attention to productivity per man; eliminate any taint of featherbedding tactics; work together and present a united front; combine efforts to sell the electrical industry; spend less time and energy in useless and unnecessary controversy.

Gordon M. Freeman, international president, International Brotherhood of Electrical Workers, suggested one solution to this problem. NECA should accept responsible contractors into their fold and IBEW should take qualified mechanics into the union. The time for action is now—without long deliberation, he added. Mr. Freeman went on to discuss the labor problems with utility plant construction and the encroachment of the Operating Engineers in the IBEW jurisdiction. Continued cooperation of NECA members to solve these problems was asked.

The competitive battle between

BIDDLE *Instrument News*

BIDDLE IMPULSE CABLE FAULT LOCATING TRANSMITTER

Model 5, 5 KV, 16 MUF

Those companies operating an appreciable amount of 600 volt cable should be particularly interested in this recently developed transmitter. Those having cable in the 2500 volt delta and 4000 volt wye insulation class will also find this transmitter well suited to their needs for proof testing and locating faults on important circuits. Similar applications include the proof testing and location of faults in drag cables such as used with electric shovels in strip mines. Still other applications include extensive lighting circuits such as used at airports and in highway lighting.

BIDDLE IMPULSE CABLE FAULT LOCATOR EQUIPMENT NOW INCLUDES:

Model 3, 25 KV, 1.65 MUF
Model 4, 15 KV, 2.00 MUF
Model 5, 5 KV, 16 MUF

Model 2 Detector for use with each of the Transmitters

Model 1 High Voltage Bridge and other accessories

Write for **Bulletin 65-ECM.**

BIDDLE DIELECTRIC TEST SET MODEL 1-40 KV

—for measuring d-c current at voltages up to 40 kv when applied to the insulation of such equipment as generators, transformers, bushings and cable.

Carefully considered safety features, excellent output voltage regulation, simple operation, compact design, and facilities for making voltage and current measurements at either polarity have been incorporated in this test set.

The set has a current rating of 25 milliamperes at short circuit, and current measurements can be made down to 0.5 microamperes which is the first division on the microammeter.

Overall dimensions are: height 19½ in., width 13½ in., depth 20 in., weight 120 lbs. All high voltage components are oil immersed.

For complete details, description, specifications, and prices, write for **Bulletin 22-ECM.**

James G. Biddle Co.
1316 Arch St., Phila. 7, Pa.

Gentlemen: Please send me

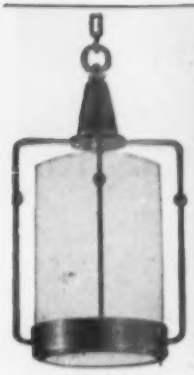
☐ **Bulletin 65-ECM.**
☐ **Bulletin 22-ECM.**

NAME
JOB FUNCTION
COMPANY
ADDRESS

JAMES G. BIDDLE CO.

• ELECTRICAL TESTING INSTRUMENTS
• SPEED MEASURING INSTRUMENTS
• LABORATORY & SCIENTIFIC EQUIPMENT

1316 ARCH STREET
PHILADELPHIA 7, PA.



Design No. 6188

First Evangelical and Ref. Church, Nashville, Tenn., Warfield & Assoc., Arch.

WANT YOUR SHARE OF $900,000,000?

That's the money going for church construction in 1957! Yes, church lighting jobs are *profitable*—and easy to land! Our FREE engineered lighting counsel actually helps you plan proper illumination for new churches or the remodeling of present stuctures. Lighting by Novelty provides many beautiful, authentic lantern creations . . . designed to harmonize with church architecture. Write for new illustrated catalogs.

CHURCH LIGHTING DIVISION

NL Corporation

formerly THE NOVELTY LIGHTING CORP.

2488-B East 22nd Street Cleveland 15, Ohio

Sherman Lugs

Sherman Solderless SS Type "All-Around" lugs are made in six sizes — #14 to 1000 MCM. Large contact surface for maximum conductivity. Open end barrel assures proper cable installation. Low silhouette — easy to install in tight places. Precision made and corrosion resistant.

Sherman — Known for quality since 1895.

H. B. SHERMAN MANUFACTURING CO.

BATTLE CREEK, MICHIGAN

line contractors and utility-crew line construction was presented by Kurt Brammer, president, American Line Builders Chapter, NECA, Chicago. In the past, NECA's dues structure had prevented many line constructors from joining, he noted. Since this obstacle has been removed, six line constructor Chapters with 111 members have been organized and two more are in the development stage. An apprentice training program for line work has been developed and will be made effective through labor agreements. Yet to be fully resolved are some outside work jurisdictional problems between regular NECA Chapters and the line construction Chapters, Mr. Brammer noted.

Any apprehension about an increase in National Electrical Benefit Fund assessments was dispelled when W. D. Howell, executive secretary-treasurer of the Fund, noted that no increase in the present 1% assessment is indicated or contemplated. A report of the National Employees Benefit Board indicated that present assessment collections from employers are averaging over $775,000 per month with an annual figure of $9.68 million projected. IBEW member payments, plus interest earned on the Fund, now average over $950,000 per month. As of Sept. 1957, some 9,116 members were receiving pension payments. The present pension fund agreement includes employers other than electrical contractors, it was noted.

Amendments and Resolutions

Unanimous approval was given to a constitutional amendment providing for temporary sponsorship of Chapters by NECA. This is a simplified substitute for the "branch" plan which was tabled at the San Francisco convention last year. Briefly, it means that any association or group of electrical contractors, already individual members of NECA, or simultaneously applying for NECA membership, can apply either for a chartered Chapter or a sponsored Chapter. Sponsored Chapters, designed primarily for less densely populated areas, will be given managerial and operational aid from the Association. In effect, this amendment provides specific authority for what has been done in the past under the Executive Committee's liberal interpretation of the Chapter Affiliation article in the constitution.

Convention approval and passage

was given to the following resolutions:

Statement of Interdependence Principles—calling for a high level of coordination and cooperation between the various segments of the electrical industry. Covered were such items as: honoring the specifications; responsibility for engineering and estimating; firm prices by manufacturer, distributor and contractor; elimination of delay in providing shop drawings; coordination of practical field experience and construction engineering in new products; standardization of knockout spacing in boxes and cabinets, and sizes and forms of materials and equipment; packaging and handling of large quantities of materials for a specific job; coordination in scheduling and delivery of materials; establishment of a definite point of finality in quotations and bids by manufacturer, supplier and contractor; elimination of improper liberal credit extension by manufacturers and distributors to "marginal" contractors.

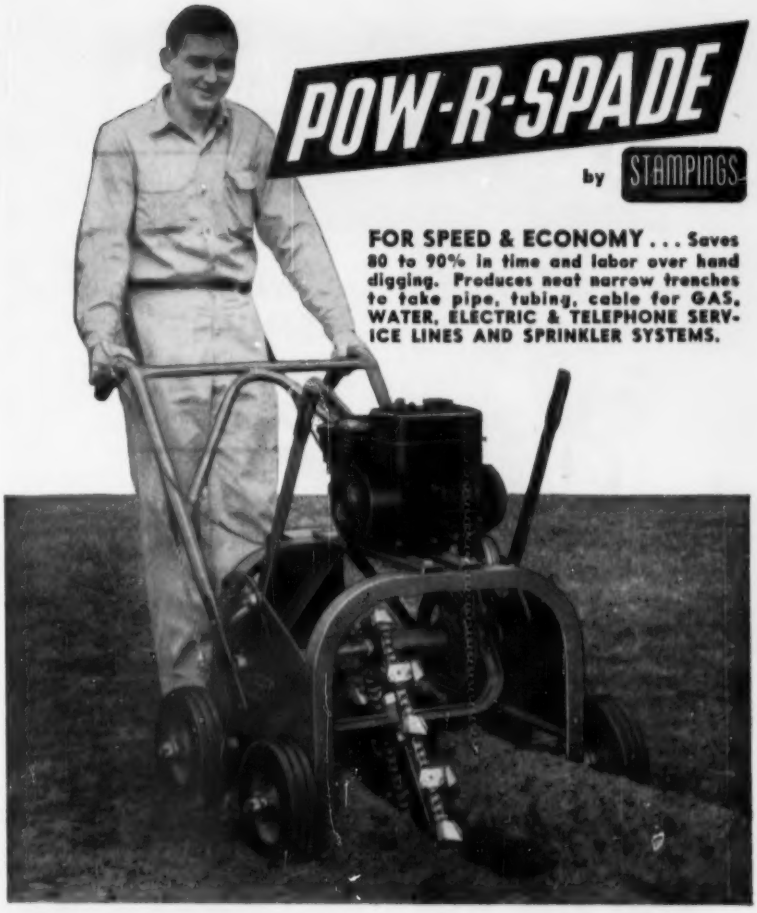
Contractor Functions — calling for manufacturers and distributors to recognize the distributive function of the electrical contractor and make provisions for a contractor's differential which will permit a contractor to sell products at a fair profit commensurate with his function.

Private Power Development—endorsing the private enterprise development of the hydro-electric power facilities of the Trinity River Project (by the Pacific Gas and Electric Company) in California.

Election of Officers

Oliver F. Burnett, chairman of the Board, Kelso-Burnett Electric Co., Chicago, was re-elected, without opposition, to his second two-year term as president of the National Electrical Contractors Association.

District vice-presidents elected at the convention are: (Dist. 1)—Harold A. Webster, T. Frederick Jackson Co., New York City; (Dist. 3)—Carl L. Teal, Knight Electric Co., Birmingham, Ala.; (Dist. 5)—G. C. White, Empire Electric Co., Inc., Ft. Worth, Texas; (Dist. 7)—Richard W. Osborn, Osborn Electric Co., St. Louis, Mo.; (Dist. 8)—W. P. Robbins, Central Electric Co., Salt Lake City, Utah; (Dist. 9)—J. D. O'Connor, Luppen & Hawley, Inc., Sacramento, California. Charles W. Moseley, R. H. Bouligny, Inc., Charlotte, N. C., was re-elected to his second term as vice-president—line construction.


POW-R-SPADE
by STAMPINGS
FOR SPEED & ECONOMY . . . Saves 80 to 90% in time and labor over hand digging. Produces neat narrow trenches to take pipe, tubing, cable for GAS, WATER, ELECTRIC & TELEPHONE SERVICE LINES AND SPRINKLER SYSTEMS.

POW-R-SPADE reduces man-hours to minutes!

Dirt is delivered finely pulverized. Easy to backfill.

A POW-R-SPADE user reports that one man and the POW-R-SPADE digs a trench in 40 minutes which under same conditions required 2 men 8 hours with hand spades. POW-R-SPADE is field tested and enthusiastically approved by hundreds of users.

POW-R-SPADE digs a neat 3 in. wide trench to any depth from 1 in. to 24 in. Operated by one man from start to finish. This machine digs right up to foundation of buildings. No complicated set-up required. No ugly scars or wheel marks to mar lawns.

Powered by well known gas engine. Safe and economical. Rugged construction. Oil sealed bearings, minimum maintenance. Shipped assembled, ready to go to work. Mail coupon for details.

A PRODUCT OF STAMPINGS DAVENPORT, IOWA

Portable from job to job—easily loaded and unloaded by one man.

Stampings, Inc. 1017½ Mound St., Davenport, Ia.

Please send material on POW-R-SPADE to:

NAME _____

COMPANY _____

STREET _____

CITY _____ STATE _____

Put the POWER PUNCH back in your Black & Decker tools

with GENUINE FACTORY BRANCH SERVICE

★ Free Tool Inspection
★ Standard B&D Guarantee

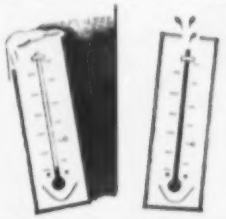
Look under "Tools-Electric" in Yellow Pages for address of your nearest FACTORY SERVICE BRANCH. Or write direct for address of nearest branch to:

THE BLACK & DECKER MFG. CO., Dept. 53112, Towson 4, Md.

B&D Black & Decker®
QUALITY ELECTRIC TOOLS

You get top performance in any weather with SANGAMO

Fair weather or foul, the Sangamo Heavy Duty Time Switch operates accurately and dependably. That's because the case is specifically constructed and gasketed to withstand adverse atmospheric conditions. It's moisture-tight. It's dust-proof. It's the time switch you can depend on for every commercial and industrial application.



OPERATING RANGE —50F TO +200F

This exceptionally wide 250 degree operating temperature range is made possible by the use of a special silicone lubricant in the Sangamo-built slow speed motor. This lubricant assures continuous operation in extreme cold or heat. See these rugged, all-weather time switches at your Electrical Wholesaler's today.

Sangamo Electric Company
SPRINGFIELD, ILLINOIS

ST57-5

Alvin N. Gray Receives McGraw Award

Alvin N. Gray, development engineer, Western Electric Company, Baltimore, Md., received the Manufacturers Medal and Purse, given under the James H. McGraw Award for Electrical Men, at the annual meeting of the National Electrical Manufacturers Association at the Traymore Hotel, Atlantic City, on November 13. A. F. Metz, chairman of the Okonite Company, made the presentation for the Committee of Awards.

Mr. Gray received the award for his development of the Room Temperature Compound Process leading to a broad advance in the technology of extruding natural and synthetic rubber insulations for electrical conductors.

The panel of judges who recommended Mr. Gray for recognition under the Award consists of: H. G. Blakeslee, Cory Corp.; R. M. Casper, Allis Chalmers Manufacturing Co.; W. S. Edsall, Chase-Shawmut Co.; E. E. Helm, Reliance Electric and Engineering Co.

1957 Estimated Lighting Sales Reported

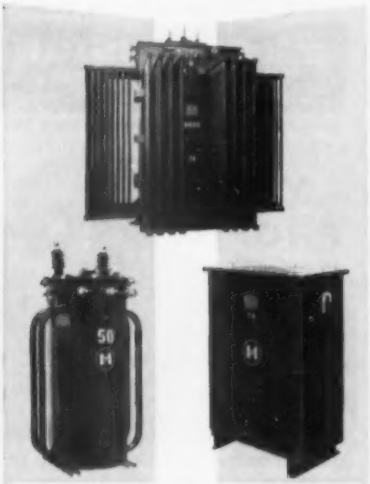
Lighting equipment sales in 1957, covering lighting equipment sold and installed for general lighting purposes, at manufacturers' selling prices, will total about $509,940,000, it is estimated, according to a report made to members of the Commercial and Industrial Lighting Equipment Section of the National Electrical Manufacturers Association at their annual fall meeting held recently at Rye, N. Y. This estimate was made and reported by Berlon C. Cooper, eastern editor, *Electrical Construction and Maintenance*, based upon an extensive study of all available statistics covering the production and sale of lighting equipment, including new building construction and modernization work. It included and supplemented the study of this subject made in 1955 which was incorporated in the forecast "What's Ahead for LIGHTING—A 10-Year Projection" (*EC&M*, October 1955).

The 1957 estimated total dollar volume sales reflect a rate of growth which, if maintained over the next eight years, will result in a $1 billion volume in 1965, it was reported. This was in line with the forecasts previously made in 1955, it was pointed out. Dollar volume

you BENEFIT when you buy transformers from HILL

Our production facilities are geared to your needs. Our interest is in your transformer problem—to solve it quickly, and at competitive cost.

At Hill Transformer, this is exemplified by a policy of prompt delivery (to jobsite in quantity)... adapting designs to special customer requirements... all transformers manufactured to NEMA and ASA standards.



OIL FILLED • ASKAREL DRY TYPES
through 5000 KVA

HILL

HILL TRANSFORMER CO., Inc.
1030 Washington St. • San Carlos, Calif.

Available from leading electrical wholesalers

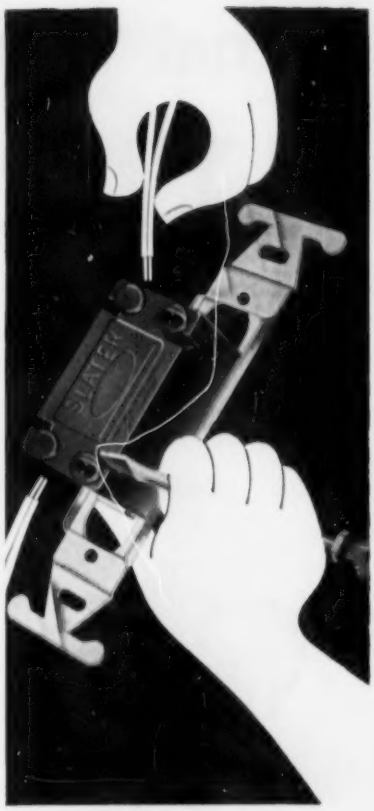
sales over a 15-year period were reported as follows: 1950—$289,715,000; 1955—$423,588,000; 1957—$509,940,000; 1960—$669,782,000; and 1965—$1 billion. The estimated volume of sales reported for 1950, 1955 and 1957 were based upon new construction and modernization actual dollar volume reported by the Department of Commerce and Bureau of Labor Statistics, while dollar volumes shown for 1960 and 1965 were based on *Electrical Construction and Maintenance* estimates for new construction and modernization work and percentage trends of lighting equipment to total new construction or modernization costs.

A detailed breakdown of the analysis for the 1957 lighting market estimate was given, showing the exact percentages used for various types of new building construction, and total dollar volume for each of the types of construction. The standard Dept. of Commerce—BLS breakdown of construction, for private and public expenditures, was used.

Total dollar volume for lighting equipment only for some of the several types of construction were: For *private expenditures*—residential, $49 million; industrial, $88.7 million; offices, warehouse and loft buildings, $46.8 million; stores, restaurants and garages, $57.5 million; religious, $18.0 million; farm construction, $1.4 million; public utilities, $15.3 million. For *public expenditures*—industrial, $8.6 million; educational, $61.9 million; hospitals and institutional, $6.5 million; military facilities, $3.7 million; all other public $23 million; highway, $10.1 million.

Building construction trends for the years 1950-1957 were shown by means of slide charts, covering residential, industrial, store, office, school, church, hospital, and highway construction. Also shown were annual electric lamp shipments for 1950 through 1956, and lighting equipment sales as reported by the U. S. Census of Manufactures for 1939, 1947 and 1954.

Lighting sales are tied primarily to two factors, it was pointed out. One is new building construction, and the other is modernization work, including relighting. The new building construction trends shown by the charts reflected continuing expansion of the lighting market for this factor. Growth of lighting for modernization work is being spearheaded by the National Lighting Bureau of NEMA, through the Certified Lighting program, it was pointed out.



MODEL 600 QUIET SWITCH

seconds to wire

One-Hand Split-Second Wire Release Without Special Tools *

THE SLATER #600 push-wire switch installs 2 minutes faster than screw terminal types. That means *more profit!* Patented side release leaves wire straight, clean, ready to rewire.

ASK YOUR WHOLESALER FOR SLATER... OR WRITE THE PLANT FOR DETAILS ON THE SLATER #600 QUIET SWITCH.

* PAT. 2,795,677

Slater
Lifetime Wiring Devices
SEA CLIFF AVENUE • GLEN COVE, NEW YORK
ORIOLE 6-1100

What is a FAIR PRICE?

*To be **FAIR**, both your customer and you must profit.*

Since 1926

NATIONAL PRICE SERVICE

suggests fair resale prices for electrical materials and tells you what they cost from day to day.

• • •

Keep current.

Be FAIR to yourself.

HENDERSON-HAZEL CORP. DEPT. A712
13601 Euclid Avenue, Cleveland 12, Ohio

Please send complete details about NATIONAL PRICE SERVICE to us immediately - no obligation.

Name .....
Title .....
Company .....
Address .....
City ..... Zone..... State .....

Charles L. Smith

Charles L. Smith, secretary-treasurer, International Association of Electrical Inspectors; and electrical field engineer, National Fire Protection Association, died suddenly November 12, 1957 at the Veterans' Research Hospital in Chicago.

His untimely passing has deprived the electrical industry of a man of great stature in the electrical safety field. During his ten years as IAEI secretary-treasurer and NFPA electrical field engineer he established himself as an outstanding authority of the National Electrical Code and other related Codes and Standards.

Mr. Smith's related activities included: liaison representative to the Canadian Standards Association; secretary of the National Electrical Code Committee and the Electrical Section of the National Fire Protection Association; editor of the National Electrical Code; revising editor of the National Electrical Code Handbook (McGraw Hill Book Co.); and editor of the News-Bulletin, IAEI official publication. He was a member of the American Institute of Electrical Engineers; International Municipal Signal Association; International Brotherhood of Electrical Workers; Society of Fire Protection Engineers; National Fire Protection Association; and International Association of Electrical Inspectors.

NISA News

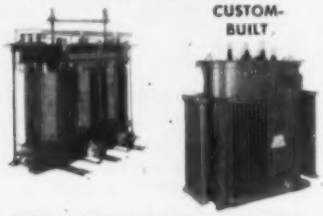
NISA will be an exhibitor for the sixth straight year at the Plant Maintenance & Engineering Show, to be held January 27-30, in Chicago at the International Amphitheatre. The association's exhibit, which stresses the economy and quality workmanship of the independent service shops in the United States and Canada, will be manned by members of the Chicago Chapter, national officers and directors, members of the national publicity

BE PRECISE -- SPECIFY PRECISION

SUBSTATION TRANSFORMERS

DRY TYPE or LIQUID IMMERSED

CUSTOM-BUILT



PRECISION—specializes in manufacturing transformers exclusively! Testing and acceptance of PTC dry type and liquid immersed substation transformers by some of industry's most critical engineers enables us to provide you with the industry's only 5-year guarantee . . . and

- Lowest noise level in the industry
- High overload capacity
- Structural steel construction
- Several-cycle vacuum impregnated windings
- Most complete range of sizes

Please send for Technical Bulletins & Catalog

PTC PRECISION
TRANSFORMER CORP.
2218 W. Lake St., Chicago 12, Ill.

Sales & Engineering Offices in All Principal Cities

YOU PROFIT

by selling NEW *Big Beam* AUTOMATIC EMERGENCY LIGHTS *with Glass Jar Batteries*

Heavy-duty, long-lived glass jar batteries come in 30, 40, 80, and 100 amp.-hr. sizes. Built-in trickle charger and fast charger has 12-hour automatic timer.

It's the most COMPLETELY DEPENDABLE emergency light ever built. When regular lights fail . . . this new Big Beam turns on instantly . . . provides many hours of illumination.

NEW *Big Beam* EXPLOSION-PROOF HAND LAMP

Approved by Underwriters' Laboratories for use in hazardous locations, Class I, Group D. Designed to meet popular demand for a SAFE lamp with Big Beam's quality features.

Write for Literature Today

U-C-LITE Manufacturing Co.
1035 West Hubbard Street, Chicago 22, Illinois
In Canada: Bernard Marks & Co., Ltd., 70 Clarement Street, Toronto 2, Ontario

SAVE Man-hours,

have correct 3-phase connections with the

KNOPP PHASE SEQUENCE INDICATOR

Push the button and see the Sequence 60–600 V.

No adjustments required for readings

You just clip on the Knopp Phase Sequence Indicator, push the safety button and you are sure whether the phase sequence is A-B-C or C-B-A.

This new model K-3 Knopp Phase Sequence Indicator, like the previous models, shows phase sequence by direction of disc rotation rather than by lamps. Gives correct indication regardless of voltage or circuit conditions without changing taps or dials. It protects equipment and assures properly connected polyphase wiring; all voltages between 60 and 600, 3 phase, 3 wire 25-60 cycles. May be used on frequencies up to 400 cycles on the higher voltages.

Light Weight, Compact, Small

It stands up under rough field use and gives accurate and reliable service. It is made by Knopp Inc., technical electric equipment manufacturers of 29 years' experience. This indicator has a laminated bakelite housing and no exposed metal parts. It is built for complete safety. Fully insulated clips can remain attached between tests as safety push button permits indication only when needed. Weighing but 21 oz., the Knopp Phase Sequence Indicator is small and easy to carry. Price $29.25; leather carrying case, $5.85 additional. Order this improved Model K-3 today or write for complete description.

KNOPP Voltage Tester

For easier, safer testing use the Knopp Voltage Tester. Gives magnitude of voltage between 110 and 600: a-c or d-c, pure or rectified; 25 or 60 cycles. See your dealer or write for illustrated free, descriptive Bulletin No. 425.

KNOPP INC.

Founded in 1928 by Otto A. Knopp under the name of Electrical Facilities Inc.

Dept. A-3, 1307 66th St., Oakland 8, Calif.

OFFICERS of the new Western Michigan Chapter of NISA with national president Alfred Elson, Jr. (right) at the group's first regularly scheduled meeting, in Grand Rapids on October 21. Left to right: Donald P. Boerma, Industrial Electric Co., Benton Harbor, Mich., secretary-treasurer; Paul D. Bogdan, Clement Electric Co., Grand Rapids, vice president; and Clark Mesler, Consolidated Electric Co., Grand Rapids, president.

committee and executive staff members.

• • • •

The Niagara Chapter held its annual fall outing at Adirondack Inn, Sacandaga Reservoir, N. Y., September 6-8.

• • • •

Emil Olson of the research and development division of Anaconda Wire & Cable Co. spoke at the October 9 meeting of Quaker City Chapter. His talk covered the types of magnet wire on the market today.

• • • •

Rectifiers and their applications were discussed by Samuel Heller of American Rectifier Corporation at a meeting of the New England Chapter on November 14 at Hotel Bradford, Boston.

• • • •

Named to the executive board of the Northwest Central Ohio Chapter were: Andrew C. Benner of Benner Electric, Columbus; Charles K. Glass of Glass Electric, Springfield; Clyde L. Pierson of Marion Electric, Marion; Fred R. Wilkin of American Electric Works, Lancaster; Byrl R. Shoemaker of B. R. Shoemaker & Son, Columbus; and Wayne O. Pierson of Newark Electric, Newark.

• • • •

More than 250 members, wives, suppliers and guests attended the annual meeting of Southeastern Chapter in Miami Beach on October 24-26. The meeting, held at the Fontainebleau, included talks by Michael Assalone of Florida Electric, Miami, who discussed

MODEL 800 RECEPTACLE

seconds to wire

One-Hand Split-Second Wire Release Without Special Tools

THE SLATER #800 push-wire receptacle can be installed 2 minutes faster than screw terminal types. Patented side release leaves wires straight, clean, ready to rewire. That means *extra profit!*

ASK YOUR WHOLESALER . . . OR WRITE THE PLANT FOR INFORMATION ON THE SLATER #800 RECEPTACLE.

* PAT. 2,795,677

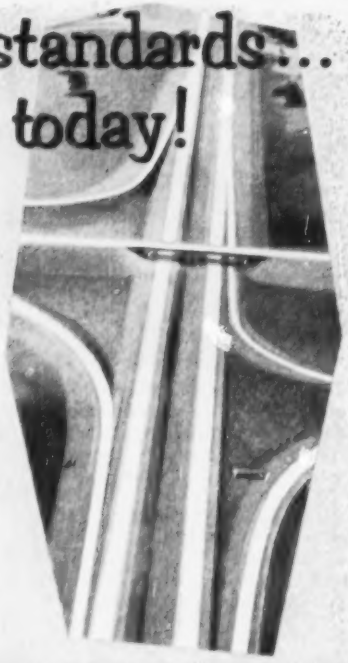
Slater

Lifetime Wiring Devices

SEA CLIFF AVENUE • GLEN COVE, NEW YORK

ORIOLE 6-1100

tomorrow's standards... today!



The Ohio Turnpike is the newest link in a national chain of superhighways that will eventually tie East to West. The most modern concepts of traffic engineering are reflected in the construction of this magnificent road. What transformers are used for service and lighting? Marcus, of course!

Electrical contractors:
Amon Electric Co., Warren, Ohio
Peterson-Webster Electric Co.
Youngstown, Ohio

Marcus TRANSFORMER CO., Inc.
RAHWAY, NEW JERSEY

"Mark of Quality"

Representatives in Principal Cities

A COMPLETE LINE OF DRY TYPE AND LIQUID-FILLED TRANSFORMERS THRU 5000 KVA

SERVICE CONTRACTORS

Here's the fuse that can make your job easier

- **NO UNNECESSARY BLOWS DURING SAFE OVERLOADS** — exclusive Pierce screen vent design permits gases and heat to escape freely. Only shorts and dangerous overloads can cause a blow. This saves you unnecessary troubles, and cuts down on costly plant downtime.
- **EASY LINK REPLACEMENT,** requiring only a screwdriver and a few seconds' work. Screws holding link have nuts locked in position. Sturdy tubular bridge assures perfect link contact and knife alignment. You don't need a lot of parts — just the replacement link.
- **LOWER FUSE COSTS.** Because your fuse body doesn't become charged by frequent blows, excessive heat and afterblows, Pierce Fuses last 6 to 8 times longer. It's worth investigating!

MAIL COUPON TODAY

PIERCE RENEWABLE FUSES, INC., Leicester, N. Y.

I would like to see and compare one of your Balanced Lag Pierce Fuses:

( ) Knife Blade Type ( ) Ferrule Type

Name .....
Company .....
Address .....
City ..... State .....

AT THE GRAND RAPIDS meeting of the new Western Michigan chapter on October 21: (left to right) E. B. Clement of Clement Electric Co., Grand Rapids, and Al Steury of Electric Motor Service, Hastings, Mich.

small motor repair problems; Oscar A. Clot of Peninsular Armature Works, Miami, who demonstrated a dynamic balancer which his firm manufactures; Dr. G. A. Cypher of General Electric who talked on insulation research; and Richard Wareham of Special Electric, who spoke on water-reducible varnishes. J. Arthur Turner Jr. of Tampa (Florida) Armature Works, showed a motion picture on business communications.

• • • •

National president Alfred Elson Jr. and staff engineer C. H. Lankford visited the Pacific Northwest Conference, a meeting of three NISA chapters—British Columbia, Puget Sound and Oregon—on November 8 in Vancouver.

• • • •

NISA's board of directors held its mid-year meeting in Milwaukee on November 14, 15 and 16 at the Hotel Schroeder. The representatives of the association's 16 regions visited the plants of Louis Allis, Allis-Chalmers and Allen-Bradley companies.

• • • •

President Elson and engineer Lankford also attended the meeting of the Los Angeles Chapter on November 12 and toured the U. S Electric Motors factory with the Southern California members before a dinner at Michael's Restaurant.

• • • •

A Northeast Conference of foremen and members of the New England, Connecticut and New York chapters will be held in Hartford, Conn. on March 15.

• • • •

A technical conference for members and foremen of the Southeastern Chapter will be held in Charlotte, N. C. at the Hotel Selwyn on April 4-5.

Southwestern Chapter's Spring meeting will be held in New Orleans at the time of NISA's 25th Convention, May. 11-14.

• • • •

Wisconsin Chapter met November 19 for discussions of questions prepared for small shop and winding discussion groups at the recent Buffalo Convention.

• • • •

Connecticut Chapter met November 7 at Waverly Inn, Cheshire, to hear Roger Chamber of Acme Electric Co., Cuba, N. Y. talk on transformer applications.

• • • •

Heart of America Chapter held its first regular meeting since it was organized last spring, in Pittsburg, Kansas at the Bresse Hotel. The members toured the Atkinson Armature Works plant.

• • • •

A credit manager for a wholesale heating supply firm, M. E. Sale of Slakey Brothers, spoke on the topic: "The Board of Trade of San Francisco, What Is It?" at the October 11 meeting of Northern California Chapter.

• • • •

Midwestern Chapter held its fall meeting in Des Moines on November 2. National president Alfred Elson Jr. and executive vice-president Joseph M. Harrington were guests.

• • • •

The February meeting of Quaker City Chapter will be "foremen's night."

• • • •

Insurance for motor shops, including product liability, business-life, completion and other kinds, were discussed by Harold R. Keenan at the October meeting of the New York Metropolitan Chapter.

AT THE MIAMI BEACH, Fla. meeting of the Southeastern Chapter on October 26: (left) Mike Assaline, manager, Florida Electric Motor Service, Miami, and Carlton A. Andrews, Jones Electric Repair Co., Charlotte, N. C., chapter president.

CIRCLOC

interlocked armor power cable

Available in No. 6 AWG to 750 MCM Copper Conductors up to 15,000 volts Varnished Cambric or Butyl Rubber Insulation Steel, Aluminum or Bronze Armor

FOR quick, easy, economical expansion or relocation of power feeders, specify *Circloc Interlocked Armor Cable.* Installs without conduit on simple supports. Trains easily around corners and obstructions for long runs. Provides its own armor for mechanical protection against damage.

NEW WIRING CALCULATOR—FREE!
Send today for this handy, useful wiring aid. Gives conduit sizes, amperage capacities, and helpful motor running data.

CIRCLE WIRE & CABLE
a subsidiary of CERRO DE PASCO CORPORATION

PLANTS: Maspeth and Hicksville, N. Y. SALES OFFICES: In all principal cities.
(Dept. EC-12) 5500 Maspeth Avenue, Maspeth, N.Y.

"BUFFALO" SKY-VENT ® POWER ROOF VENTILATORS

NOW! **EFFICIENT PACKAGE ROOF FANS FOR EASY INSTALLATION!**

Yes, complete units with motor, fan, housing, weather hood, dampers and integrally welded roof curbing—ready to install! "Buffalo" Sky-Vents ® are ideal for your roof exhaust jobs in the wide capacity range from 1000 to 250,000 cfm. Available in Style "H" (illustrated) or cylindrical vertical discharge Style "V", both of typical heavy-duty "Buffalo" construction with efficient "Buffalo" Propeller or Axial Flow Fan. Write for Bulletin FM-2345 and prices on these popular new fans.

BUFFALO FORGE COMPANY
520 Broadway Buffalo, N. Y.
Canadian Blower & Forge Co., Ltd., Kitchener, Ont.
Sales Representatives in all Principal Cities

"Buffalo"

INDUSTRIAL EXHAUSTERS — BELTED VENT SETS — PROPELLER FANS — "E" BLOWERS — EXHAUSTERS

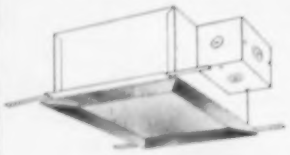
NEW!

LOW-COST
FEATURE PACKED

pryne

RECESSED LIGHT

MODEL 1080



Full Sized Reflector
for maximum lighting efficiency.

Larger Splice Box
a full 32 cu. in. inside area that's accessible from inside after installation. Accessible from both end and bottom during installation. 6 concentric ½ and ¾ inch knock-outs with Pry-out slots on Splice Box.

Snap-Up Front*
Patented front attachment with modern styled fronts.

Redi-Set Hanger**
Adapted for use with exclusive Redi-Set Hanger Straps available from your electrical jobber.

* Patent No. 2,639,368
**Patent No. 2,642,241

The ultimate in low-cost recessed lighting. With easy-to-install features built-in to reduce time and labor costs.

pryne UL

Emerson-Pryne Company EC-12
P.O. Box 698, Pomona, California

Rush me complete information and specifications on the NEW Pryne Model 1080 Recessed Light Fixture:

Name
Company
Address
City State

Far Western Sections of IAEI

Snap-in, interchangeable circuit breakers and what to do about them proved to be one of the major bones of contention at the two Far Western section meetings of International Association of Electrical Inspectors as it had at the other section meetings reported in EC&M, November issue. At both the Southwestern Section annual meeting held in Phoenix Nov. 4 to 6 the last of the series, and the Northwestern Section held in Spokane at the beginning of the series this problem came up for vigorous comment from the floor in open forum discussions.

The initiation of an educationai program to be conducted through public school classes, probably at night, to train electrical inspectors was probably the most significant development at the Southwestern Section meeting. Suggested by Barney Alverson, San Bernardino County electrical inspector, who became the Southwestern Section president at this meeting, it was an outgrowth of the workshop-type of annual meeting initiated last year at the Berkeley annual meeting. The sessions were again successfully carried forward in Phoenix.

Authority was voted for the formation of a special committee of inspectors who have had educational experience to develop a course of study which can be used by chapter groups or by a municipality in training of its inspection staff.

The committee is headed by Prof. Irving J. Sandorf, Electrical Engineering Department, University of Nevada, who is the section's second vice president. On the committee with him are Charles Pierce, city inspector of Fresno, who has been conducting code classes in the San Joaquin Valley, and Les Waggoner, Arizona Public Service Co., secretary of the Arizona Chapter.

Purpose of the course would be to promote uniform understanding and application of the National Electrical Code and secure better and more uniform inspection methods. It would also help in the collection and dissemination of information relative to the safe uses of electricity and to promote closer cooperation between inspectors, the electrical industry and the public.

At the election of officers Barney Alverson, San Bernardino County inspector, was made president to succeed Frank Jones, of Arizona Fire Rating Bureau. Jones presided over the Arizona convention, the first ever held in that state.

CAN YOU LOOK DOWN YOUR AISLES

WITHOUT LAMP GLARE

MULTI "ILE LITES"

Will give uniform illumination where needed to the top shelf as well as to the bottom shelf.

Reflector is porcelain enameled — the best for life-time cleaning.

STOP EXTRA HANDLING ERRORS ACCIDENTS

SEND FOR CATALOG

MULTI ELECTRIC MFG. Inc.
4237 W. LAKE ST.
CHICAGO 24, ILL.

SAVE TIME AND MONEY HANDLING CABLE REELS

Easy, simple, fast! Minimum loading and unreeling effort. Modernly efficient

FOR WIRE, CABLE, ROPE

- *Heavy gauge steel frame*
- *Slanted front*
- *Ball bearing adjustable rollers*
- *No jacks*
- *Handles any reel diameters*
- *Positive roller lock for unloading*

Style A 2,000 lbs. cap. for reels up to 28 in. wide. 46.50 f. o. b. Cincinnati.

Style B 4,000 lbs. cap. for 2 reels up to 24 in. wide each or 1 reel up to 48 in. wide. 84.50 f.o.b. Cincinnati.

WRITE FOR DETAILS TODAY

ROLL•A•REEL
4630 Reading Road Cincinnati 29, Ohio

Sound Powered Telephones

need no batteries

Never fail in any emergency because they operate without current of any kind over a distance of many miles. Can be moved with the job as construction progresses or serve permanently where power failures may occur. In outdoor and indoor models.

Write for illustrated catalog

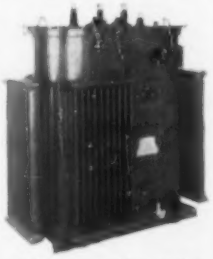
HOSE-McCANN TELEPHONE CO., INC.

761 THIRD AVENUE, BROOKLYN 32, N. Y.

BE PRECISE -- SPECIFY PRECISION

LIQUID FILLED TRANSFORMERS

with the EXCLUSIVE 5-YEAR GUARANTEE



OIL or ASKAREL FILLED

Above-average overload capacities and a rugged structural steel construction guaranteed to give years of top service make PTC LIQUID FILLED TRANSFORMERS ideal for all power and lighting distribution systems —indoors or out. Reinforced insulation is used over the entire winding. Cork-oprene gaskets are used thruout and the copper coils are vacuum impregnated thru several complete cycles. PTC transformers meet or exceed NEMA, ASA and AIEE specs.

Single and 3 Phase Up to 45,000 volts

Please write for TECHNICAL BULLETINS & Catalogs

PTC PRECISION
TRANSFORMER CORP.
2218 W. Lake St., Chicago 12, Ill.

Chester Hefner, of San Mateo County, was named first vice president; Prof. Irving J. Sandorf, University of Nevada, second vice president; and Arthur P. Vesco, San Diego city inspector, third vice president. L. E. LeFehr, of Alhambra city, was reelected secretary-treasurer. On the executive committee named were Cecil Clark, of Arizona; Charles Pierce, of Fresno; E. Warren Small, Hawaii; M. E. Lundberg, of Elko, Nev.; Ernest Nelson, San Leandro; Lester Woldit, of Sacramento; Ed Muller, of the California Division of Industrial Safety; H. K. Winterer, General Electric Co.; H. G. Ufer, Rome Cable Co.; and William A. Cyr, Electrical West.

Northwestern Section

First of the series, the Northwestern Section met in Spokane for its 31st annual meeting with some 180 delegates and their wives. H. S. Morr served not only as section president but also as president of the International association. He gave his first talk there setting forth the economic situation of the IAEI and the steps by which its operations might be brought within its income.

Here, too, the problems arising from amateurs and "do it yourselfers" as well as appliance salesmen in the changing of low rated snap-in circuit breakers for those of higher rating without respect to the wire size came up for considerable discussion. The section recommended limitations be set up by the code as to the interchangeability ranges.

Other code changes asked were that where water heaters or driers carry dual ratings that Underwriters' Laboratories rate only the highest on the label so that the proper wire size for the maximum can be provided. Higher wattages in ceiling fixtures have caused many fires and changes in the code regarding these were asked for. Temporary wiring circuits, it was likewise requested, should be protected from overcurrent.

Officers elected were: Park H. Forte, Boise city inspector, president; James A. Paxton, Spokane city inspector, first vice president; Edward M. Tubbs, Bellingham city inspector, second vice president; W. L. Gaffney, Tacoma, reelected secretary-treasurer. The executive committee is composed of J. F. Gray, Portland; Elden L. Shirley, Billings; J. B. Gawne, T. M. Woodridge, and B. A. Travis, Seattle; J. Hyde Stayner, Salt Lake City.

Get This NEW IDEAL SIMPLET MALLEABLE IRON PULLING ELBOW

PRECISION MACHINED FOR PERFECT FIT

It's Made Better for Your Needs!

- MEETS J.I.C. and N.M.T.B.A. STANDARDS
- elbow is malleable iron, cadmium plated
- steel cover is cadmium plated with larger screws designed to fit snugly in opposed corners without protruding inside
- cover domed for greater rigidity, provides more working space and more wire area inside elbow
- full neoprene cover gasket (not cut out)
- ground smooth surfaces assure tighter cover and gasket seal
- more metal at inside 90° bend provides stronger, more durable elbow
- no obstructions inside, all smooth surfaces
- hubs have precision tapered pipe threads and are positioned *exactly* 90° from center
- sold complete with covers, screws and elbows, shipped assembled
- sizes marked on both covers and elbows

SIZES . . . ½", ¾", 1", 1¼", 1½", 2"

SEE YOUR WHOLESALER . . .

IDEAL-SIMPLET FITTINGS, INC.
A Subsidiary of Ideal Industries, Inc.
1041-L Park Avenue, Sycamore, Ill.

SEND COUPON FOR ALL FACTS

IDEAL-SIMPLET FITTINGS, Inc.
1041-L Park Ave., Sycamore, Ill.
Send Pulling Elbow prices & data. ☐
Send complete line catalog. ☐

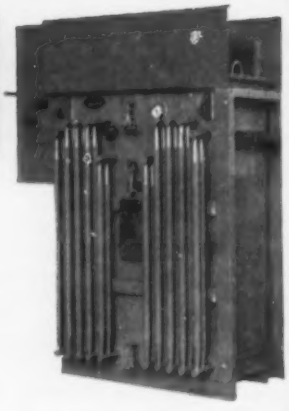
Name_____

Company_____

Address_____

City_____ Zone____ State_____

LOAD CENTER TRANSFORMERS



Let Standard Transformer Company engineers help you meet load center problems. We'll work with you to design the transformers required to operate with existing switchgear or with new switchgear. Send us your plans or problems today and let us work out a practical, efficient, and economical solution with you. Write Standard or contact the nearby Standard Transformer Company Representative.

Type HT Askarel filled transformer 500 KVA, three phase, 2400x4800 volts primary, 480Y/277 volts secondary Equipped with high voltage disconnect and transition panels for fitting with low voltage switchgear section.

Standard®

THE STANDARD TRANSFORMER COMPANY

WARREN, OHIO

REPRESENTATIVES IN PRINCIPAL CITIES

PENNDRILL

MASONRY DRILLING EQUIPMENT

DRILL CONCRETE in SECONDS

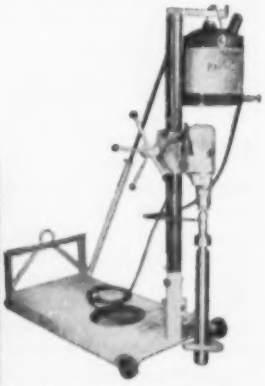
Not Minutes Not Hours

The Penndrill Model "E" is a complete drilling unit, easily operated by one man and drills holes from 1 to 14 inches in diameter up to 19 inches deep.

Requires no set up time and presents no problems for drilling holes close to walls or in corners—one man can carry it up stairs.

Using diamond bits, it drills neat, clean holes vertically, horizontally or at any angle in concrete, asphalt, marble, granite, including any pipe, conduit, steel, etc. that might be encountered in the drilling.

PENNSYLVANIA DRILLING COMPANY
Masonry Drill Division
1021 Banksville Road, Pittsburgh 16, Pa.



Complete catalogue on request

DATES AHEAD

Industrial Heating Equipment Assn., Inc.—Penn-Sheraton Hotel, Pittsburgh, Pa., January 27-28, 1958.

American Society of Heating & Air Conditioning Engineers — Annual meeting, Penn-Sheraton Hotel, Pittsburgh, Pa., January 27-29.

Plant Maintenance & Engineering Show—International Amphitheatre, Chicago, Ill., January 27-30.

Southeastern Electrical Wholesalers Assn.—Annual convention, Biltmore Hotel, Atlanta, Ga., January 29-31.

Upper Midwest Electrical Convention & Trade Exposition — Leamington Hotel and Municipal Auditorium, Minneapolis, Minn., February 2-5.

Power & Communications Contractors Assn. — 13th annual convention, Roosevelt Hotel, New Orleans, La., February 2-5.

American Institute of Electrical Engineers—Winter general meeting, New York, N. Y., February 2-7.

National Industrial Electric Heating Conference — Netherland Hilton Hotel, Cincinnati, Ohio, February 3-6.

National Rural Electric Cooperative Assn. — Annual meeting, Dallas, Texas, February 2-6.

National Electrical Week—An all-industry event, February 9-15.

National Adequate Wiring Conference—Hotel Statler, Detroit, Mich., February 20-21.

First National Lighting Exposition—Coliseum, New York City, March 9-12.

Electrical Contractors Assn. of Ontario—London Hotel, London, Ontario, Canada, March 20-22.

Electrical Industry Show and Electrical Maintenance Conference — Shrine Exposition Hall, Los Angeles, Calif., March 27-29.

Illuminating Engineering Society — **Northeastern** Conference, Statler Hotel, Hartford, Conn., April 10-11; **East Central** Conference, John Marshall Hotel, Richmond, Va., April 14-15; **South Central-Southeastern** Conference, Lafayette Hotel, Little Rock, Ark., April 24-25; **Southwestern** Conference, Washington Youree Hotel, Shreveport, La., April 28-29; **Midwestern** Conference, Hotel President, Kansas City, Mo., May 1-2; **Inter-Mountain** Conference, Whitman Hotel, Pueblo, Colo., May 8-9; **South Pacific** Conference, El Cortez Hotel, San Diego, Calif., May 12-13; **Pacific Northwest** Conference, Multnomah Hotel, Portland, Ore., May 22-24; and **Great Lakes** Conference, Sheraton Hotel, Rochester, N. Y., June 23-24.

Rocky Mountain Electrical League—Annual convention, Shirley Savoy Hotel, Denver, Colo., April 13-20.

National Industrial Assn. — 25th "Jubilee Celebration," Hotel Roosevelt, New Orleans, La., May 11-14.

National Fire Protection Assn.—Annual meeting Palmer House, Chicago, Ill., May 19-23.

National Association of Electrical Distributors—50th annual convention, Civic Auditorium, San Francisco, Calif., June 9-13.

Edison Electric Institute — Annual convention, Convention Hall, Boston, Mass., June 9-12.

Two New Mineralac Quality Products Designed for Jobs Too Heavy for Standard Jiffy Clips

MINERALLAC Heavy Duty AND Medium JIFFY CLIPS

Also available without mounting hole for use with gun.

patent pending

Made of heavier materials! Has exclusive inverted rib, that provides more strength at the bend of clip . . . and, of course, adds the benefits of famous "Snap On" feature!

In stock in Zinc-Plated Steel for Thin Wall or Rigid Conduit up to 6". (Hot Dipped Galvanized may be obtained on order) Can be substituted for malleable clips.

Order From Your Electrical Wholesaler

SEND FOR LITERATURE

MINERALLAC ELECTRIC COMPANY

25 North Peoria St. Chicago 7, Ill.

MINERALLAC

NOW! Get RUSH **RED CARPET** Service When YOU Need It!

HELWIG CARBON BRUSHES

Helwig's new Rush Order Department assures you immediate delivery on emergency orders.

Next time when your problem is costly "down time" . . . depend on HELWIG for immediate Red Carpet Service . . . Yours at no extra cost.

HELWIG CO.

CARBON PRODUCTS

2546 N. 30th ST. HELWIG SPEER

MILWAUKEE 10, WIS.

New York State Assn. of Electrical Contractors & Dealers, Inc.—Annual convention, Whiteface Inn, Lake Placid, N. Y., June 29-July 4.

Illuminating Engineering Society — National Technical Conference, Toronto, Canada, August 17-22.

International Association of Electrical Inspectors—Western Section, Sheraton-Cadillac Hotel, Detroit, Mich., September 8-10; **Northwestern Section,** Billings, Mont., Sept. 15-17; **Southwestern Section,** Southern California, September 22-24; **Canadian Section,** Montreal, Quebec, Canada, October 10-11; **Eastern Section,** October 13-15; **Southern Section,** Miami, Fla., October 20-22.

International Association of Electrical Leagues—Annual Conference, Washington, D. C., October 1-3.

National Electrical Manufacturers Assn. — Annual conference, Hotel Traymore, Atlantic City, N. J., November 10-14.

National Electronics Conference, Inc. —Hotel Sherman, Chicago, Ill., October 13-15.

National Electrical Contractors Assn. —Annual convention and National Electrical Exposition, Adolphus Hotel, Dallas, Texas, November 16-21.

Among the Manufacturers

Headquarters Announcements

Federal Pacific Electric Co., Newark, N. J., has purchased the **Penn Electrical Co.,** Irwin, Pa.

Kirkwood Commutator Corp., Cleveland, Ohio, has purchased the **Pres-On Switch Co.** of Winston-Salem, N. C.

Hitemp Wires, Inc., Westbury, N. Y., has acquired the **Union Plastics Corp.** of New Jersey.

Piolite Div. of Pioneer Plastics, Inc., has moved to 28 Goodhue St., Salem, Mass.

Permacel-Lepage's Inc. is the new name of **Permacel Tape Corp.,** New Brunswick, N. J.

International Resistance Co., Philadelphia, Pa. — J. Burton Henry, sales manager, New Products Div.; Walter H. Powell, vice president in addition to present duties as director of industrial relations.

Westinghouse Electric Corp., Bloomfield, N. J.—Robert J. Sampson, national accounts sales manager, Lamp Division.

Jefferson Electric Co., Bellwood, Ill.—Joseph W. Steiner, director of engineering.

Miller Co., Meriden, Conn.—John J. Neidhart, manager, application engineering, Illuminating Division.

Omark Industries, Inc., Port-

ETP

CONNECTORS and COUPLINGS

NOW AVAILABLE IN 1½" and 2" SIZES

Now . . . ETP's UL approved fittings are available in an even greater size range. For safe, quick installations that are UL approved as Concrete-Tight —that cannot rust or corrode conduit—always specify ETP.

- **Pre-set and staked screws. No backing out to insert conduit.**
- **One-piece solid tubular steel—heavily plated finish.**
- **Pre-sized for uniformity of fittings.**
- **Self-centering flat bead shoulders.**

ALSO AVAILABLE IN ½", ¾", 1" & 1¼" SIZES

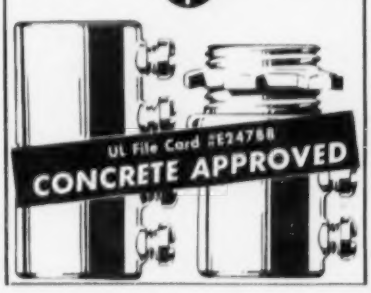
ELECTRIC TUBE PRODUCTS

74-16 Grand Avenue

Maspeth (N.Y.C.), N. Y.

DEfender 5-8000

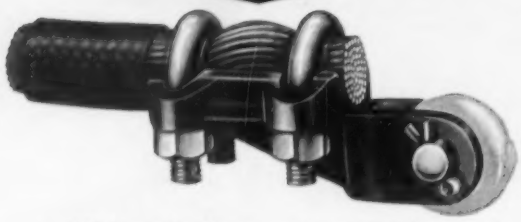
CONNECT WITH ETP FOR ECONOMY



LOCK CABLE SAFELY, SECURELY with—

"EFFICIENCY" Cable Strain Clamps

without Strain or Damage



. . . Withstands direct pull of 17,000 pounds

Efficiency Cable Strain Clamps lock cable safely and securely without possible strain or damage. "H" construction of clamps and high ridge across center of cable prevents cable from slipping. Takes cable from 1/0 to 1,500,000 c. m. Three clamp sizes cover all cable sizes. Furnished with eye or clevis, for AC or DC Service.

Write for Catalog 38-A

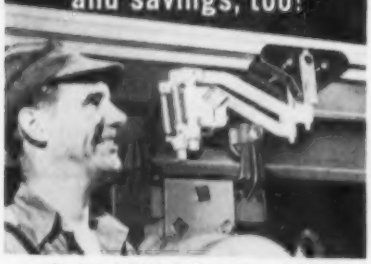
"EFFICIENCY" DEVICES for CONDUIT and CABLE SUSPENSION

Efficiency ELECTRIC AND MANUFACTURING CO.

MANUFACTURERS OF EFFICIENCY ELECTRICAL DEVICES FOR CONDUIT AND WIRE CABLE SUSPENSION

EAST PALESTINE, OHIO

SAFETY FIRST and savings, too!



with INSUL-8-BAR® SYSTEMS

Mobile Safety Electrification for Cranes, Monorails, All Moving Machinery.

These are the only enclosed conductor systems that meet all requirements of mobile safety electrification. Standard catalog parts eliminate the need for special engineering. Installation is fast, maintenance easy. Investigate today!

CLIP COUPON FOR CATALOG

INSUL-8 CORP.

INSUL-8-CORP.
Dept. A, 1369 Industrial Rd., San Carlos, Calif.

Rush catalog re Insul-8-Bar mobile electrification.

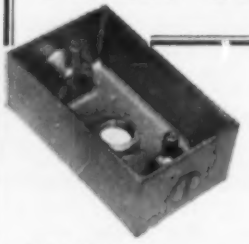
NAME_____

COMPANY_____

ADDRESS_____

ONE AND TWO-GANG ALUMINUM

WEATHERPROOF OUTLET BOXES



CATALOG NO. T-11
Ruggedly constructed. One Hub on each end and back. Comes with one Aluminum Plug.

CATALOG NO. T11-2
One Hub on one end and back. Two Hubs on other end. Two Aluminum Plugs.

SPECIFICATIONS
Made of weatherproof, cast Aluminum and comes with ½" holes on both ends and back, and internal Hubs. Size: 2¾" x 4½" x 1¾" deep. ALSO AVAILABLE IN NEW TWO-GANG MODEL WITH 3, 4 OR 5 HOLES. ASK ABOUT IT TODAY.

FOR THE NAME OF YOUR NEAREST P-L DISTRIBUTOR WRITE . . .

PERFECT-LINE MANUFACTURING CORP. Hicksville, L. I., N. Y.

land, Ore.—Harold G. Cutright, general sales manager.

Emerson Electric Mfg. Co., St. Louis, Mo.—Richard B. Loynd, merchandise sales manager.

Sunbeam Lighting Co., Los Angeles, Calif.—Rex L. Zinn, lighting consultant at new Gary, Ind., plant.

Thomas Industries Inc., Louisville, Ky.—E. Allan Lea, sales manager, Lighting Division.

Kurz & Root Co., Appleton, Wis.—Henry Kuhn, quality control manager.

Bryant Electric Co., Bridgeport, Conn.—Robert E. Fromson, works manager.

Anaconda Wire & Cable Co., New York, N. Y.—P. Howard Farley, manager, distributor and contractor sales.

Steber Mfg. Co., Broadview, Ill.—Urban Doyle, manager, Service Station Lighting Division.

Speedway Mfg. Co., Cicero, Ill.—David G. Collins, vice president.

Drayer-Hanson, Los Angeles, Calif.—C. W. Pollock, manager, Air Conditioning and Refrigeration Div.

United States Rubber Co., New York, N. Y.—John W. McGovern, president; Eugene A. Luxenberger and George R. Vila, group vice presidents; Earle S. Ebers, vice president and general manager of Chemical Division.

Weston Electrical Instrument Corp., Newark, N. J.—Emil Nichols, manager of test equipment sales; A. R. Walthers, manager tachometer sales; Paul M. Heilman, distributor sales manager.

Benjamin Electric Mfg. Co., Des Plaines, Ill.—A. E. Swedenborg, vice president in charge of sales.

Regional Appointments

NEW ENGLAND

Weston Electrical Instrument Corp.: Edward P. Reid, manager of new district sales office in Boston, Mass.

MIDDLE ATLANTIC

Edwin F. Guth Co.: John T. Fite, Jr., lighting sales engineer for Southeastern Pennsylvania, Southern New Jersey and Northeastern Delaware, office in Philadelphia.

BullDog Electric Products Co.: Robert F. James, Eastern Region Electrostrip sales engineer.

Westinghouse Electric Corp.: Charles W. Marr, sales representative, Pittsburg office of Welding Department.

SOUTH ATLANTIC

Curtis Lighting, Inc.: Hawn & Stear, Inc., Pittsburgh, sales rep-

WHERE TO BUY

Equipment, Materials, Supplies and Services for Electrical Construction—Maintenance—Repairs

IDENTIFICATION NAME PLATES

For controls and panels—precision engraved on bakelite or black anodized alum.—any titles—quick service by mail on large or small jobs—send for sample and prices.

ATLANTIC ENGRAVERS, INC.
52 Ocean Ave. Amityville, N. Y.

Rotometers - Plan Measures
• Tally Counters • Voltmeters • Megohmeters

R. A. KOENEMAN COMPANY

1409 Delmar Blvd. St. Louis, Mo.
International Trade Mart New Orleans, La.

MAIL ORDERS PROMPTLY FILLED

TO manufacturers of equipment and those offering special services, this section offers an inexpensive means of keeping products or services regularly before your potential customers—the readers of ELECTRICAL CONSTRUCTION & MAINTENANCE. The small spaces available here provide opportunity for you to be represented in every issue at low cost. Can we serve you?

ELECTRICAL CONSTRUCTION & MAINTENANCE

NEW SUBSCRIPTION ORDERFORM

ELECTRICAL CONSTRUCTION & MAINTENANCE
330 West 42nd Street
New York 36, N. Y.

Please enter by personal subscription to start as soon as possible:

☐ $3.00 enclosed for one year*
☐ Send invoice

Please Print

Name .....

Title or Position .....

Address—Home ☐
Company ☐

City ..... Zone.....

State .....

Company Name .....

.....

Nature of Company's Business .....

I am in charge of elec. work—Yes ☐ No ☐

Operate a motor repair shop—Yes ☐ No ☐

*Above rates good only in U. S. Please write for rates in other countries.

representatives in Pittsburgh area and West Virginia.

Rawlplug Company: David O. Grattan, branch manager in Miami, Fla.

Accurate Mfg. Co.: W. H. Lassiter Sales Co., Charlotte, N. C., agents in North and South Carolina.

Pass & Seymour, Inc.: William C. Robertson, Hollywood, Fla., sales representative for Florida-South Georgia territory.

EAST CENTRAL

Alpha Wire Corp.: Raymond Ives, Mid-Western sales manager, office in Chicago.

Miller Company: John H. Riley, representative in Chicago area.

Hamilton Beach Co.: James R. Carrier, territorial representative for lower Michigan and Toledo, Ohio, office in Inkster, Mich.

Carrier Corp.: Arco Engineering Co., sales representatives in Louisville, Kentucky area.

Kuhlman Electric Co.: Jay G. Gates, representative for Southwestern Ohio and Kentucky.

Baldor Electric Co.: George Touschard, district sales manager for Dayton, Ohio area.

WEST CENTRAL

Curtis Lighting, Inc.: Charles P. Wallick, sales engineer for Minneapolis area; Dupont-Wachter & Co., sales representatives in New Orleans, La.

General Electric Co.: Robert J. Shulte, manager of Mississippi Valley sales district, Large Lamp Dept., office in St. Louis.

WEST

Square D Co.: Daniel H. Miller, manager of Western Division, office in Los Angeles.

Koppers Co. Inc., Wood Preserving Div.: W. W. Hanly, Jr., manager of sales, San Francisco area.

Thor Power Tool Co.: Alfred W. Escoffier, manager of Seattle, Wash., branch.

Rawlplug Company: Edward Staskus, manager, San Francisco branch.

Smoot-Holman Co.: C. D. Belt and Co., Denver, sales representatives for Colorado, West Texas and New Mexico.

SEARCHLIGHT SECTION

(Classified Advertising)

EMPLOYMENT — EQUIPMENT — USED OR RESALE — BUSINESS OPPORTUNITIES

UNDISPLAYED RATE

(Not available for equipment advertising)

$1.80 a line, minimum 3 lines.

POSITIONS WANTED undisplayed rate is one-half of above rate, payable in advance.

Box Numbers—Count as one line.

Discount of 10% if full payment is made in advance for 4 consecutive insertions.

DISPLAYED RATE

EQUIPMENT & BUSINESS OPPORTUNITY advertising $17.90 per inch.

EMPLOYMENT OPPORTUNITIES—$24.00 per inch, subject to Agency Commission.

An Advertising inch is measured ⅞" vertically on one column, 3 columns—30 inches to a page

Send new ads to Classified Advertising Div., Electrical Construction & Maintenance, P.O. Box 12, New York 36, N. Y.

January issue closes December 20th.

REPRESENTATIVES

$225.00 profit per average direct sale with a well known natl. adv. pipe tool. A MUST for every contractor and industry using pipe or conduit. No tech. knowl. required. Shipped on trial to help get orders. Leads furnished. Write background, ref., etc. to:

RW-6270, Electrical Construction & Maintenance 520 N. Michigan Ave., Chicago 11, Ill.

Manufacturing Rights Wanted

English Manufacturing company specializing in equipment for Power Stations, Oil Refineries, Chemical Plants, desire to contact American manufacturers of tension pipe supports for boiler pipes and equipment with view to making in England under license. Large volume of sales assured. Please send full details to Gittins and Mellor Limited,

OUNSDALE WORKS
Ounsdale Road, Wombourn
Near Wolverhampton, Staffs

BUYERS OF
SURPLUS COPPER
WIRES AND CABLES
PIERCE WIRE & CABLE CO.
2939 N. Paulina Chicago 13, Ill. Eastgate 7-4777
Inspections Made Everywhere
Firm Offers Cheerfully Made

"SEARCHLIGHT" IS Opportunity Advertising

—to help you get what you want—to help you sell what you no longer need.

Take Advantage Of It

For Every Business Want

"THINK SEARCHLIGHT FIRST"

Advertising In This Issue

Abolite Ltg. Div., the Jones Metal Prod. Co. 112
• Accurate Mfg. Co. ..... Second Cover
Adam Electric Co., Frank 40, 41
• Advance Transformer Co. 59
Allen-Bradley Co. 169, 170
Allis Chalmers Mfg. Co. 6, 116
Aluminum Co. of America 16, 161
• American Brass Co., The American Metal Hose Branch 158, 159
AMP Inc. 28, 29
Anaconda Wire & Cable Co. 129
• Anderson Electric Corp. 31
Appleton Electric Co. 2
• Arrow Conduit & Fittings Corp. 142
Atlantic Engravers, Inc. 201
Automatic Switch Co. 62

Baldor Elec. Co. 157
Beaver Pipe Tools Inc. 180
Biddle Co., James G. 187
Black & Decker Mfg. Co. 190
Blackhawk Industries 178
Bryant Electric Co., The 109
Buffalo Forge Co. 195
BullDog Electric Products Co. 53
Burndy Corp. 103

Century Electric Co. 47
Certified Ballast Mfgrs. 143
• Champion DeArment Tool Co. 150
Champion Lamp Works 160
Circle Wire & Cable, a Subsidiary of Cerro de Pasco Corp. 195
• Conduit Pipe Products Co. 186
Corning Glass Works 181
• Crescent Insulated Wire & Cable Co. 61
• Crouse-Hinds Co. 1
Cutler-Hammer, Inc. 154

Day-Brite Ltg. Inc. 124, 125
Delta Engineering Sls. Co. 172
Diamond Wire & Cable Co. 30
Disston Div., Henry, H. K. Porter Co., Inc. 27
Dow Corning Corp. 60

Efficiency Elec. & Mfg. Co. 200
Electrical Construction & Maintenance 201
• Electric Tube Products 199
Emerson-Pryne Co. 196
Erico Products, Inc. 108
Exide Industrial Div., The Electric Storage Battery Co. 179

• Fullman Mfg. Co. 128
Furnas Electric Co. 146

• General Cable Corp. 51
• General Electric Co.
• Apparatus Sales Div. ..... Fourth Cover
17, 18, 19, 20, 21
Construction Materials Div. 132, 133
Distribution Assemblies Dept. 33, 34
35, 36
Lamp Div. 156
• Wiring Device Department 42
Goodrich Chemical Co., B. F. 50
• Graybar Electric Co., Inc. 68
• Greenlee Tool Co. 174
• Guth Co., The Edwin F. 104

Heinemann Electric Co. 15
• Helwig Co. 199
• Henderson-Hazel Corp. 192
Hill Transformer Co., Inc. 191
• Hose-McCann Telephone Co., Inc. 197
• Hubbell Inc., Harvey 148, 149

• Ideal Industries, Inc. 176, 177
• Ideal-Simplet Fittings, Inc. 197
Insul-8 Corp. 200
• I-T-E Circuit Breaker Co.
Small Air Circuit Breaker Div. 63
• Switchgear Div. 64, 65
Transformer & Rectifier Division 66

• Johns-Manville 48
Jones Metal Products Co., The 112

• Kaiser Aluminum & Chemical Sls., Inc. 114, 115
• Killark Elec. Mfg. Co. 127
Klein & Sons, Mathias 126
Knopp Inc. 193
Koeneman Co., R. A. 201

• Leviton Mfg. Co. 175
• Lidseen of North Carolina Inc. 134
Lighting Products, Inc. 22
Litecontrol Corp. 32

• Marcus Transformer Co., Inc. 194
McGill Mfg. Co. 46
• Midwest Elec. Mfg. Co. 120
• Minerallac Elect. Co. 199
• Multi Electric Mfg. Inc. 196

NL Corp. 188
National Electric Products Corp. 182
• National Price Service 192
Nye Tool Co. 110

• O. Z. Electrical Mfg. Co., Inc. 166, 167
• Okonite Co., The 147, 185
• Onan & Sons Inc., D. W. 168
Orangeburg Mfg. Co., Inc. 58

Pass & Seymour, Inc. 106
Pennsylvania Drilling Co. 198
Perfect-Line Mfg. Corp. 200
• Phelps Dodge Copper Products Corp. 43
Pierce Renewable Fuses, Inc. 194
• PLM Products, Inc. 138
• Precision Transformer Corp. 192, 197
Pyle-National Co., The 55

Quadrangle Mfg. Co. 130

Radio Corp. of America 171
• Ramset Fastening Inc. 162

• Remington Arms Co., Inc. 131
Revere Elect. Mfg. Co. 8
Reynolds Metals Co. 135, 136
Ridge Tool Co., The 139
Rockbestos Products Corp. 54
Rohm & Haas Co. 11
Roll-A-Reel 196
Rome Cable Corp. 37, 38, 39

• S & C Electric Co. 113
Sangamo Elec. Co. 190
Sherman Mfg. Co., H. B. 188
• Simplex Wire & Cable Co. 49
Slater Electric & Mfg. Co., Inc. 23, 137, 191, 193
• Sola Electric Co. 111
• Sorgel Electric Co. 44
Spang-Chalfant (Div. of the National Supply Co.) 151
Square D Co. ..... Third Cover, 12, 13
Stampings, Inc. 189
• Standard Transformer Co. 198
Sunbeam Ltg. Co. 45

• Thomas & Betts Co., The 52

• U-C Lite Mfg. Co. 192
Union Insulating Co. 172
Uptegraff Mfg. Co., R. E. 24, 25

• Wagner Electric Corp. 26, 123
• Walker Brothers 173
• Western Insulated Wire Co. 144, 145
• Westinghouse Electric Corp.
Lamp Div. 140, 141
• Pittsburgh 56, 57, 152, 153
Wheeler Reflector Co. 163
• Wheelock Signals Inc. 186
Where To Buy 201
• Wiegand Co., Edwin C. 164

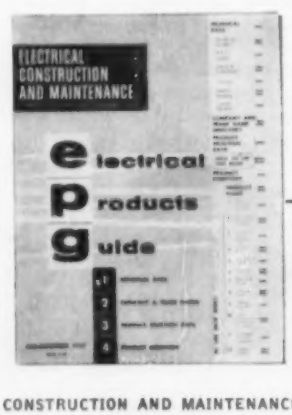
• Youngstown Sheet & Tube Co., The .. 14

■

CLASSIFIED ADVERTISING

F. J. Eberle, Business Mgr.

EMPLOYMENT OPPORTUNITIES ... 201
EQUIPMENT
(Used or Surplus New)
For Sale 201
WANTED
Equipment 201



• These manufacturers advertised their products in the ELECTRICAL PRODUCTS GUIDE

For more complete information, and application data on their lines, refer to the index of Advertisers in the ELECTRICAL PRODUCTS GUIDE . . . the 13th issue of ELECTRICAL CONSTRUCTION AND MAINTENANCE.

THE INDEX
TO THIS VOLUME HAS BEEN REMOVED
FROM THIS POSITION AND PLACED AT
THE BEGINNING OF THE FILM FOR
THE CONVENIENCE OF READERS.

Advertising In This Issue

Abolite Ltg. Div., the Jones Metal Prod. Co. 112
• Accurate Mfg. Co. ..... Second Cover
Adam Electric Co., Frank 40, 41
• Advance Transformer Co. 59
Allen-Bradley Co. 169, 170
Allis Chalmers Mfg. Co. 6, 116
Aluminum Co. of America 16, 161
• American Brass Co., The American Metal Hose Branch 158, 159
AMP Inc. 28, 29
Anaconda Wire & Cable Co. 129
• Anderson Electric Corp. 31
Appleton Electric Co. 2
• Arrow Conduit & Fittings Corp. 142
Atlantic Engravers, Inc. 201
Automatic Switch Co. 62

Baldor Elec. Co. 157
Beaver Pipe Tools Inc. 180
Biddle Co., James G. 187
Black & Decker Mfg. Co. 190
Blackhawk Industries 178
Bryant Electric Co., The 109
Buffalo Forge Co. 195
BullDog Electric Products Co. 53
Burndy Corp. 103

Century Electric Co. 47
Certified Ballast Mfgrs. 143
• Champion DeArment Tool Co. 150
Champion Lamp Works 160
Circle Wire & Cable, a Subsidiary of Cerro de Pasco Corp. 195
• Conduit Pipe Products Co. 186
Corning Glass Works 181
• Crescent Insulated Wire & Cable Co. 61
• Crouse-Hinds Co. 1
Cutler-Hammer, Inc. 154

Day-Brite Ltg. Inc. 124, 125
Delta Engineering Sls. Co. 172
Diamond Wire & Cable Co. 30
Disston Div., Henry, H. K. Porter Co., Inc. 27
Dow Corning Corp. 60

Efficiency Elec. & Mfg. Co. 200
Electrical Construction & Maintenance 201
• Electric Tube Products 199
Emerson-Pryne Co. 196
Erico Products, Inc. 108
Exide Industrial Div., The Electric Storage Battery Co. 179

• Fullman Mfg. Co. 128
Furnas Electric Co. 146

• General Cable Corp. 51
• General Electric Co.
• Apparatus Sales Div. ..... Fourth Cover 17, 18, 19, 20, 21
Construction Materials Div. 132, 133
Distribution Assemblies Dept. 33, 34 35, 36
Lamp Div. 156
• Wiring Device Department 42
Goodrich Chemical Co., B. F. 50
• Graybar Electric Co., Inc. 68
• Greenlee Tool Co. 174
• Guth Co., The Edwin F. 104

Heinemann Electric Co. 15
• Helwig Co. 199
• Henderson-Hazel Corp. 192
Hill Transformer Co., Inc. 191
• Hose-McCann Telephone Co., Inc. 197
• Hubbell Inc., Harvey 148, 149

• Ideal Industries, Inc. 176, 177
• Ideal-Simplet Fittings, Inc. 197
Insul-8 Corp. 200
• I-T-E Circuit Breaker Co.
Small Air Circuit Breaker Div. 63
• Switchgear Div. 65
Transformer & Rectifier Division 66

• Johns-Manville 48
Jones Metal Products Co., The 112

• Kaiser Aluminum & Chemical Sls., Inc. 114, 115
• Killark Elec. Mfg. Co. 127
Klein & Sons, Mathias 126
Knopp Inc. 193
Koeneman Co., R. A. 201

• Leviton Mfg. Co. 175
• Lidseen of North Carolina Inc. 134
Lighting Products, Inc. 22
Litecontrol Corp. 32

• Marcus Transformer Co., Inc. 194
McGill Mfg. Co. 46
• Midwest Elec. Mfg. Co. 120
• Minerallac Elect. Co. 199
• Multi Electric Mfg. Inc. 196

NL Corp. 188
National Electric Products Corp. 182
• National Price Service 192
Nye Tool Co. 110

• O. Z. Electrical Mfg. Co., Inc. 166, 167
• Okonite Co., The 147, 185
• Onan & Sons Inc., D. W. 168
Orangeburg Mfg. Co., Inc. 58

Pass & Seymour, Inc. 106
Pennsylvania Drilling Co. 198
Perfect-Line Mfg. Corp. 200
• Phelps Dodge Copper Products Corp., 43
Pierce Renewable Fuses, Inc. 194
• PLM Products, Inc. 138
• Precision Transformer Corp. 192, 197
Pyle-National Co., The 55

Quadrangle Mfg. Co. 130

Radio Corp. of America 171
• Ramset Fastening Inc. 162

• Remington Arms Co., Inc. 131
Revere Elect. Mfg. Co. 8
Reynolds Metals Co. 135, 136
Ridge Tool Co., The 139
Rockbestos Products Corp. 54
Rohm & Haas Co. 11
Roll-A-Reel 196
Rome Cable Corp. 37, 38, 39

• S & C Electric Co. 113
Sangamo Elec. Co. 190
Sherman Mfg. Co., H. B. 188
• Simplex Wire & Cable Co. 49
Slater Electric & Mfg. Co., Inc. 23, 137 191, 193
• Sola Electric Co. 111
• Sorgel Electric Co. 44
Spang-Chalfant (Div. of the National Supply Co.) 151
Square D Co. ..... Third Cover, 12, 13
Stampings, Inc. 189
• Standard Transformer Co. 198
Sunbeam Ltg. Co. 45

• Thomas & Betts Co., The 52

• U-C Lite Mfg. Co. 192
Union Insulating Co. 172
Uptegraff Mfg. Co., R. E. 24, 25

• Wagner Electric Corp. 26, 123
• Walker Brothers 173
• Western Insulated Wire Co. 144, 145
• Westinghouse Electric Corp.
Lamp Div. 140, 141
• Pittsburgh 56, 57, 152, 153
Wheeler Reflector Co. 163
• Wheelock Signals Inc. 186
Where To Buy 201
• Wiegand Co., Edwin C. 164

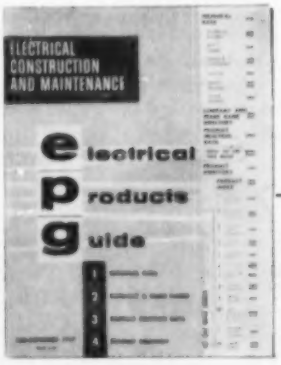
• Youngstown Sheet & Tube Co., The .. 14

■

CLASSIFIED ADVERTISING

F. J Eberle, Business Mgr.

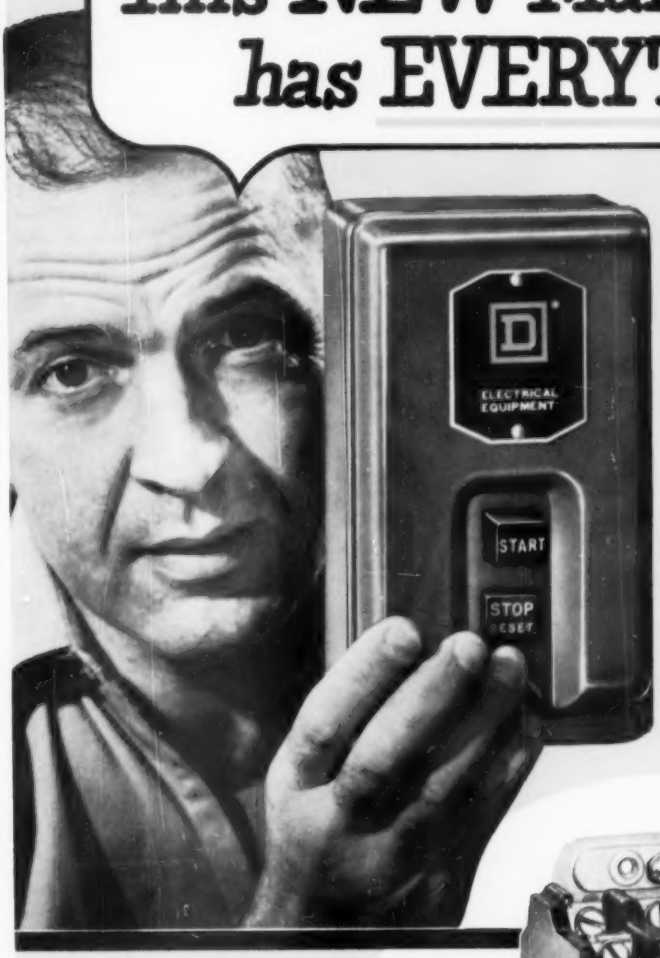
EMPLOYMENT OPPORTUNITIES ... 201
EQUIPMENT
(Used or Surplus New)
For Sale 201
WANTED
Equipment 201



• These manufacturers advertised their products in the ELECTRICAL PRODUCTS GUIDE

For more complete information, and application data on their lines, refer to the index of Advertisers in the ELECTRICAL PRODUCTS GUIDE . . . the 13th issue of ELECTRICAL CONSTRUCTION AND MAINTENANCE.

This NEW Manual Starter has EVERYTHING!



NEMA Sizes 0 and 1

Two, three and four-pole construction

SMALLER! Takes less space, whether it's built into machine or mounted externally

SMART STYLING! Matches the streamlined appearance of today's modern machines

QWIK-MAKE, QWIK-BREAK! Positive snap-action opening and closing of contacts. Longer contact life

TRIP-FREE OVERLOAD PROTECTION! Impossible for operator to hold motor circuit closed against overload

LONGER LIFE! *Toggle Action* operating mechanism. Heavy-duty construction throughout

EASIER INSTALLATION! Wire it without removing starter from enclosure. All terminals have pressure wire connectors

EASIER MAINTENANCE!
"Off-the-Shelf" parts kits make normal maintenance and modifications easier than ever. They're easy to buy, easy to identify, and faster to install

TAMPER-PROOF!
Cover padlocking device prevents tampering by unauthorized personnel. Safety latch locks "start" button in "OFF" position

VISIBLE INDICATION OF OVERLOAD!
Self-centering push-buttons show when overload has occurred

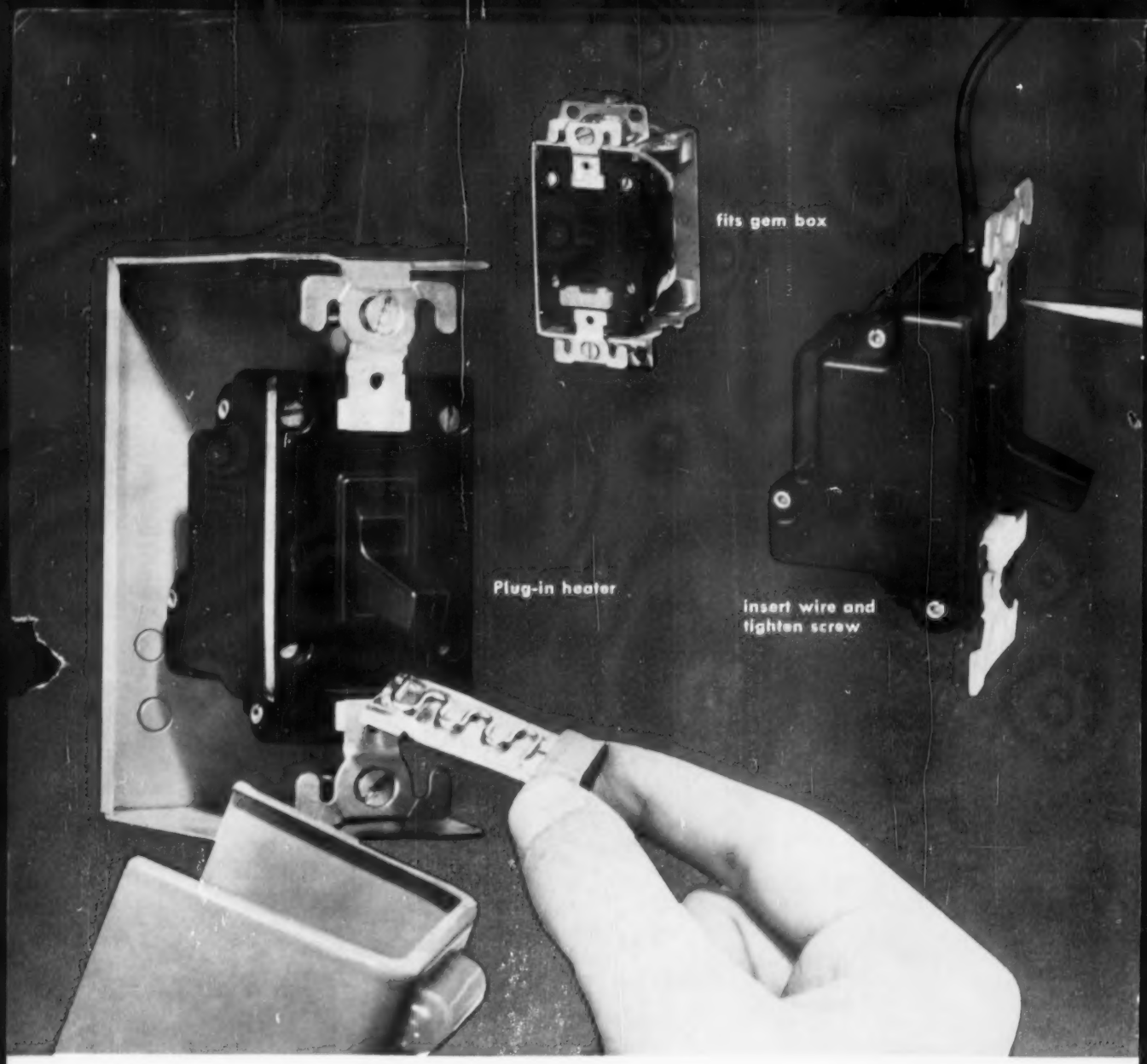
CHOICE OF ENCLOSURES:

Water and Dust-Tight
Hazardous Locations
Flush Mounting

Write for **BULLETIN 2510 B-C**
Address Square D Company,
4041 North Richards Street,
Milwaukee 12,
Wisconsin

EC&M HEAVY INDUSTRY ELECTRICAL EQUIPMENT...NOW A PART OF THE SQUARE D LINE

SQUARE D COMPANY



PLUG-IN HEATER, NEW TERMINAL DESIGN CUT INSTALLATION TIME ON . . .

General Electric's new manual starter

You can install the heater in the new General Electric manual starter in less than three seconds. Heater plugs in from the front of the starter and is keyed so it can't possibly be inserted the wrong way.

NEW TERMINAL DESIGN cuts wiring time. All you do is strip wire, insert in terminal opening and tighten screw on front of unit. No awkward looping of wires around terminals and no bare wires exposed. Connecting leads is simple because all wiring is straight through.

NEW SMALLER General Electric manual starter, shown actual size above with cover removed, fits gem or handy boxes. A new indicating light form with the light mounted on the cover, is the same size as the standard form. A wrap-around cover lifts off to give greater accessibility.

FOR MORE INFORMATION contact your G-E distributor or write advertising section 733-33 for bulletin GEA-6358. General Electric Co., Bloomington, Ill.

GENERAL ELECTRIC